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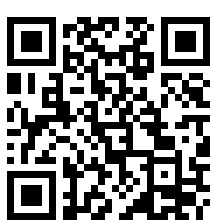

THE RAILWAY MAGAZINE

VOL. XXXIII.

JULY TO DECEMBER

1913.

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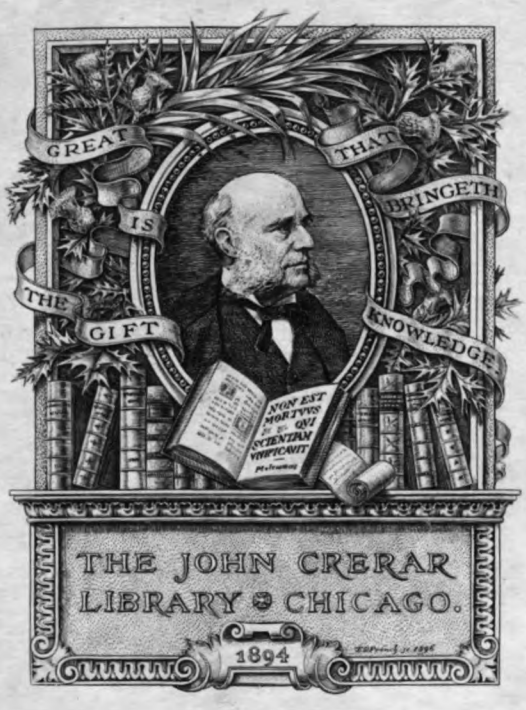
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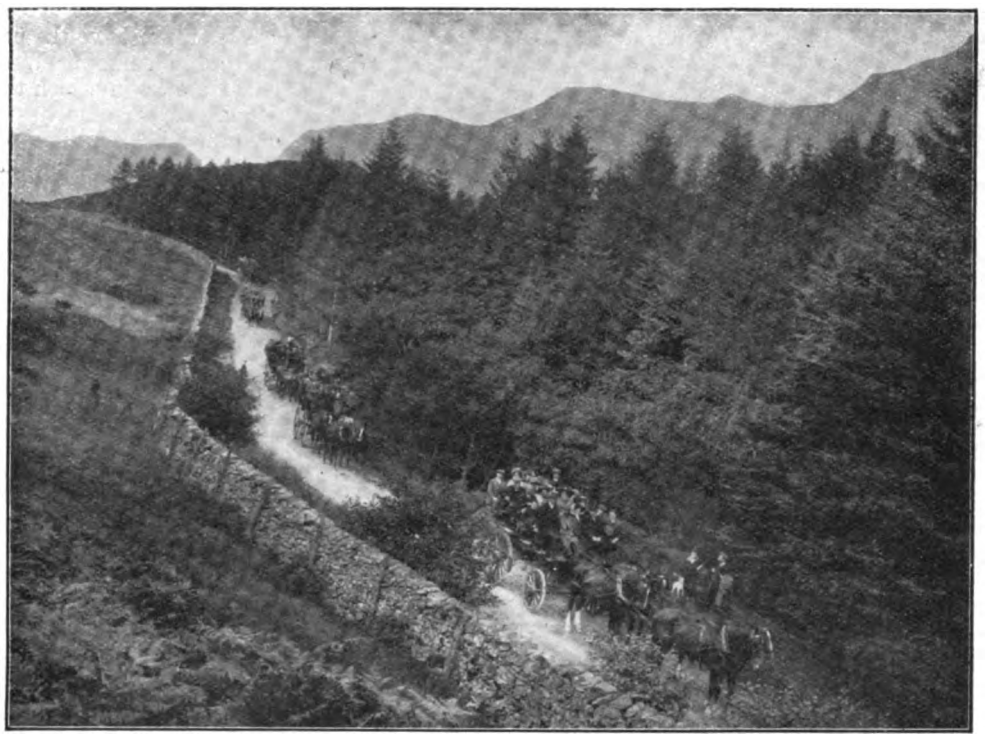

FURNESS RAILWAY COMPANY'S COACHES DESCENDING YEWDALE (AMBLESIDE TO CONISTON).

THE FURNESS RAILWAY SYSTEM:

ITS SERVICES, RESOURCES AND ATTRACTIONS.

By W. T. PERKINS.

THE story of the Furness Railway could be told at no season more appropriate than the present, when it becomes the centre of such genuine admiration by people travelling not only from every part of the United Kingdom, but from more distant places in the Empire and from foreign countries, where there ever exists an undying love for the beauty spots of old England. Although not a gigantic undertaking, the Furness Company has taken a prominent place among British transport systems—first by reason of the fact that it has aided greater ones than itself in making known to the world the wondrous lake scenery of Cumberland and Westmorland, and second because it has, by its own enterprise and resource, helped to create a huge industrial centre, and to develop one of the richest hematite iron ore fields in existence. Notwithstanding its significance, the history of the railway has not hitherto been narrated with the fulness to which it is entitled. I therefore, offer no apology for the unusual length to which this contribution extends, written as it has been with the generous co-operation of Mr. Alfred Aslett, the Secretary and General Manager, supplemented by that of Mr. Pettigrew, the Locomotive Superintendent; of Mr. A. A. Haynes, Superintendent of the Line; Commander C. Bissett, R.N., Harbour Master at Barrow-in-Furness, and other chief officers of the company.

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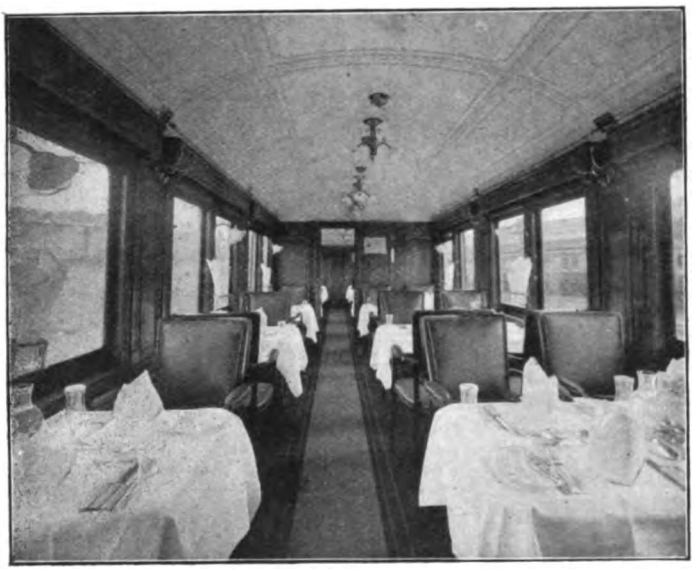

FIRST-CLASS RESTAURANT CAR: IN TRAINS TO THE LAKE DISTRICT (LONDON AND NORTH WESTERN RAILWAY).

Passengers have the use of the magnificent West Coast stock, in which the acmé of comfort is guaranteed. It may be mentioned, as an indication of the watchfulness ever exercised by the officials of the traffic and locomotive departments of the company, that galvanised iron bars are now fixed across all side doors near the lavatories, so that passengers cannot inadvertently open the wrong door, and fall out upon the permanent way while any train is in motion.

The Midland Company's summer service had not been definitely fixed when this article was completed, but it will be very much the same as in the summer of 1912 :—

THE JOURNEY FROM LONDON TO LAKELAND.

No one can be surprised that the English Lakeland should continue to attract pleasure seekers from all over the world. It is, of course, easily accessible from every part of Lancashire, as also from Yorkshire and other great counties in the North and the Midlands; but the splendid train services provided by the London and North Western and Midland Companies offer abundant means of access from many more distant places in Great Britain. During the present month (July), as also in August and September, the daily services on the London and North Western and Furness lines will be substantially the same as last summer, namely :—

THE FURNESS SYSTEM: ITS RAILWAY, DOCK AND HARBOUR.

The Furness Railway extends from Carnforth to Whitehaven—a distance of 74 miles. At the former station it links on the one hand with the London and North Western system, and on the other with the Midland. Turning sharply to the West, it runs along the shore of Morecambe Bay, and, crossing the river Keer, reaches Silverdale, the first of the many well-built and commodious stations on the line. The Furness Company have, indeed, good reason to be proud of all their picturesque stations, which compare favourably with those of any other company in the United Kingdom, as

Between London and North Western and Furness line, through carriages :—

WEEK DAYS.

Cambridge to Whitehaven ..... at	9.42 a.m.—†		Liverpool (Exc'ge) at	2.45 p.m.
Liverpool (Exchange) to W'haven at	2.52 p.m.—†		Liverpool (Lime St.) at	11.40 a.m.—†
Liverpool (Lime St.) to W'haven at	10.10 a.m.	Whitehaven to	London (Euston) at	6.40 a.m.
	12.45 a.m.			7.40 a.m.—E
	12.5 night—C			8.10 a.m.—D
London (Euston) to Whitehaven at	10.10 a.m.			11.30 a.m.
	11.25 a.m.—†			2.45 p.m.
	2. 0 p.m.		Manchester (Ex.) at	11.40 a.m.—†
Manchester (Ex.) to W'haven at	10.15 a.m.			2.45 p.m.
	2.55 p.m.			
Manchester (Vic.) to W'haven at	7.55 a.m.			
Preston to Barrow (Central) .... at	10. 5 p.m.			

A Corridor Train (with 1st and 3rd Class Dining Cars) is run from London (Euston) to Carnforth in connection with the 7.23 p.m. Train from Carnforth to Whitehaven and from Preston to London (Euston) in connection with the 2.45 p.m. Train from Whitehaven to Carnforth.

Dining Cars—London to Crewe—in connection with the 10.50 p.m. Train Carnforth to Barrow.

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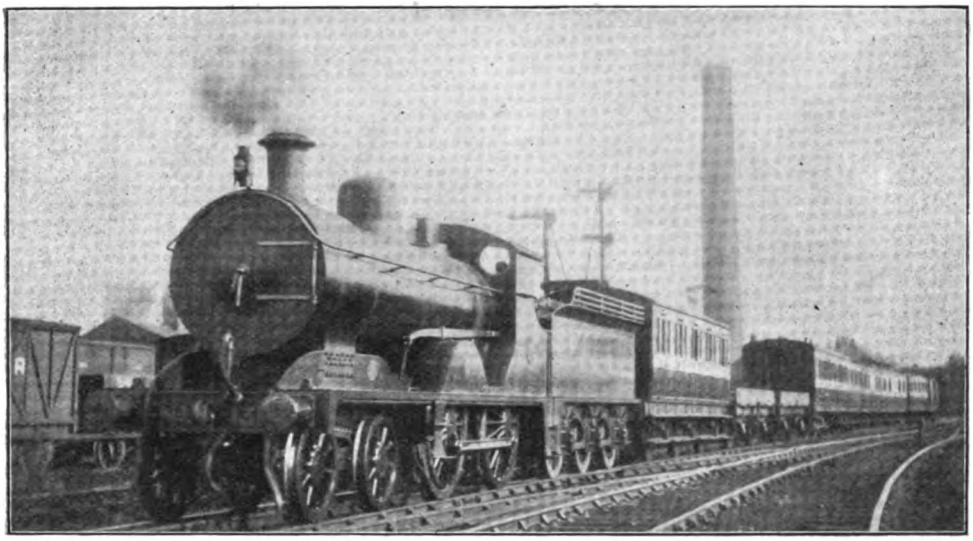


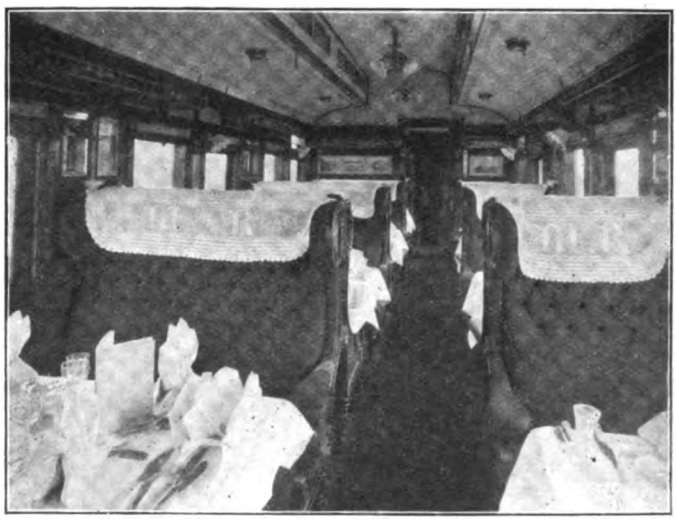
Photo] [*H Kelland.*

FURNESS RAILWAY: NEW 4–4–0 LOCOMOTIVE LEAVING CARNFORTH ON A LOCAL TRAIN.

Between Midland and Furness Line:—

Bradford to Hellifield to	Barrow (Central) ... at	10.8 a.m.
	Lake Side (W'dm're) at	6.15 a.m.—A
	Barrow (Central) ... at	6.30 p.m.
	Whitehaven ..... at	6.30 p.m.
	Lake Side (W'dm're) at	6.30 p.m.
Leeds to Barrow (Central) .... at		6.25 a.m.—A
		6.35 a.m.—B
		10. 5 a.m.
		1.55 p.m.
		3.40 p.m.
Leeds to Whitehaven ..... at		10. 5 a.m.
		1.55 p.m.
Leeds to Lake Side (W'd'm're) at		6.25 a.m.—A
		1.55 p.m.
		3.40 p.m.
Barrow (Central) to Bradford .. at		3.35 p.m.
Barrow (Central) to Leeds .... at		12.20 p.m.
		5.40 p.m.
		6.52 p.m.—A
Whitehaven to Leeds ..... at		6.40 a.m.
		8.10 a.m.—D
		11.30 a.m.
		2.45 p.m.
Lake Side (Windermere) to Bradford at		7.40 p.m.—A
Lake Side (Windermere) to Leeds .... at		10.30 a.m.
		12.15 p.m.
		4.10 p.m.
		7.40 p.m.—A

A—Thursdays and Fridays excepted, and till August 30th only. B—Thursdays and Fridays only till August 29th, and daily commencing September 1st. C—Saturdays excepted. D—Corkickle Station. E—From Corkickle and Monday, August 4th excepted. † Commencing July 12th, 1913.



FIRST-CLASS DINING CAR: IN TRAINS TO THE LAKE DISTRICT (MIDLAND RAILWAY).

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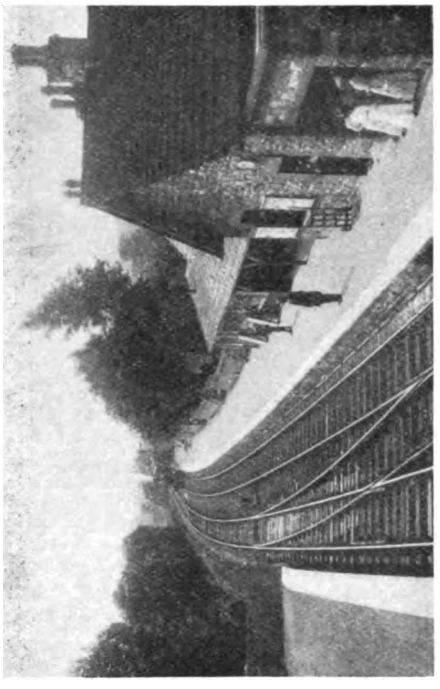
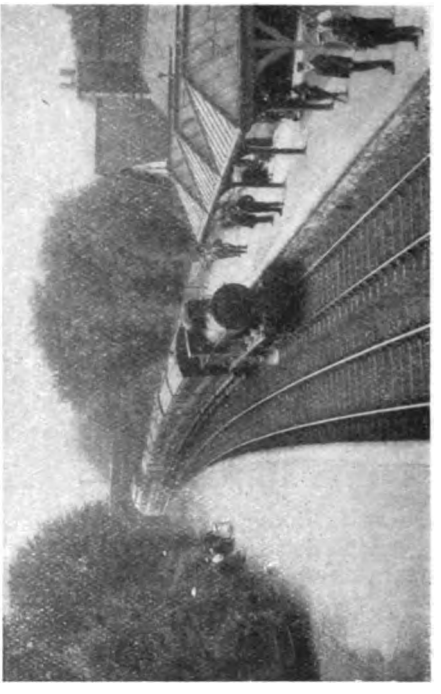
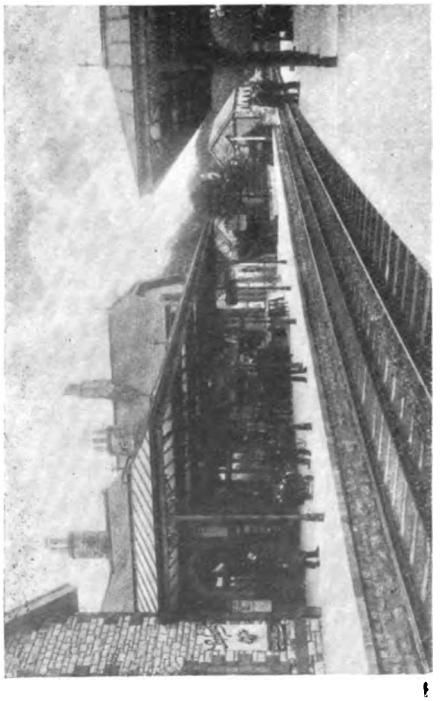


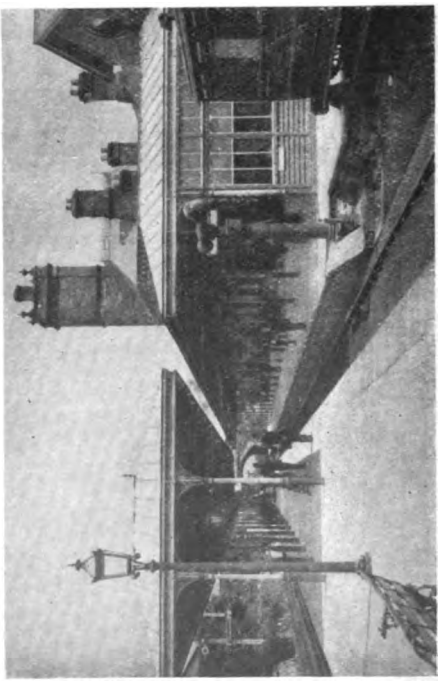
ARNSIDE STATION.



CARK STATION.



GRANGE STATION.



ULVERSTON STATION.

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is shown by the photographs now reproduced. The next station is Arnside, and there appears a branch which goes through Sandside and Heversham to Kendal. From Arnside the main line crosses the estuary of the Kent by means of an iron viaduct, and skirting the shore, runs into Grange, "with more prettiness to the square inch than any other place between Wales and Scotland." Proceeding, the line reaches Kents Bank, and later crosses the elevation of Humphrey Head. Thence it continues through Cark to Ulverston, branching off again through Greenodd, Haverthwaite and Newby Bridge to Lake Side, Windermere, at the end of that beautiful lake. The main line is carried through Lindal, Dalton, Furness Abbey, and Roose, to Barrow-in-Furness, the great shipbuilding port, and then proceeds northward through Askam, Kirkby, and Foxfield, making a detour of the estuary of the Duddon along the wild sea coast to Whitehaven. At Foxfield the line sends out another branch through Broughton, Woodland and Torver to Coniston.

G. P. Abraham] [*Keswick.*

SEASCALE: A DELIGHTFUL SEASIDE RESORT ON THE FURNESS RAILWAY.

From Foxfield, the main section continues through Millom, Silecroft, Bootle, Eskmeals, Ravenglass and Drigg to Seascale, where passengers join the coach going to Wastwater, one of the most romantic of the English Lakes and the chosen meeting place of the Lake District mountaineers. Mr. J. R. Whiting, who keeps the hotel there, is himself a climber of long experience, and his advice should be sought by all who do not happen to be familiar with the dangerous places on the steep heights in the neighbourhood. Every accessory that climbers want is kept at hand in the hotel—soft-nailed boots, stout ropes, ice axes, and the rest of an essential climbing outfit—and the little cabinet in the smoke room contains the well-read library of the club, whose members revel in feats of daring among crags and ghylls. As a rule, by the exercise of caution, especially in "foot-work," these athletic men and women—women being quite as enthusiastic as men—escape serious accident, but the graveyard of the primitive church, seating exactly 40 worshippers, is the last resting place of at least three intrepid men who, with a fourth visitor, were killed not long ago.

Seascale itself is a delightful and deservedly popular marine resort, yearly attracting an increasing number of pleasure seekers. It has an uninterrupted frontage to the Irish Sea, and has become famous chiefly, perhaps, because of its 18-hole golf course, which is admitted to be one of the finest in the Kingdom. The beach of hard sand forms a safe and most enjoyable bathing ground, and an inexpensive holiday may here be spent in perfect quiet amid the healthiest surroundings. The Furness Railway Company are about to erect a commodious refreshment pavilion at Seascale on the down platform, with a verandah facing the sea. This accommodation will be greatly appreciated by the thousands of excursionists who visit the place during the season, and it is hoped that the new building will shortly be ready for use. St. Bees Head is seen a little to the north of Seascale, and close to, at St. Bees, is the well-known Benedictine Church and the Grammar School, founded in 1587 by Archbishop Grindal, the latter now being conducted as a high-class public school, attended by students from every part of the country.

Whitehaven, the northern terminus of the line, is only a few miles beyond St. Bees, and at Marron Junction there is a junction with the Cockermouth, Keswick, and Penrith railway, by which the northern section of the Lake District may be conveniently reached. Words fail to describe the glory of the lakes, the waterfalls and

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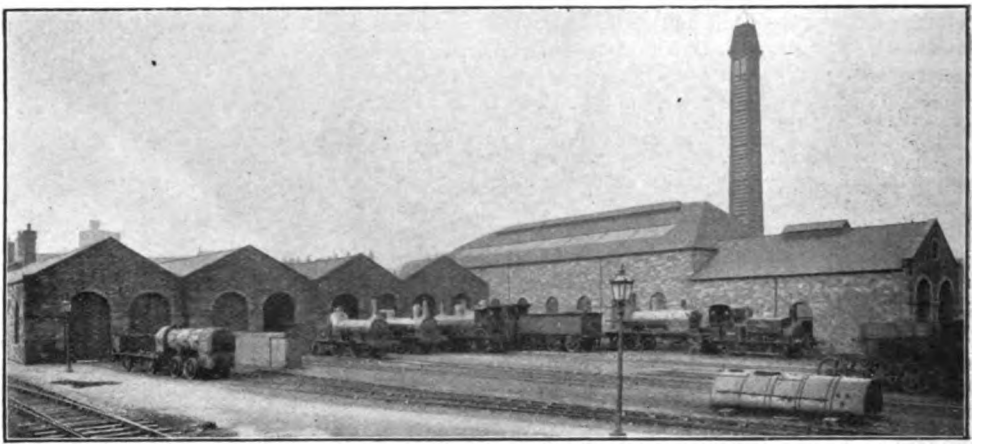


Arthur Hollis] [*Barrow-in-Furness.*

F. R. LOCOMOTIVE SHOPS: BARROW-IN-FURNESS.

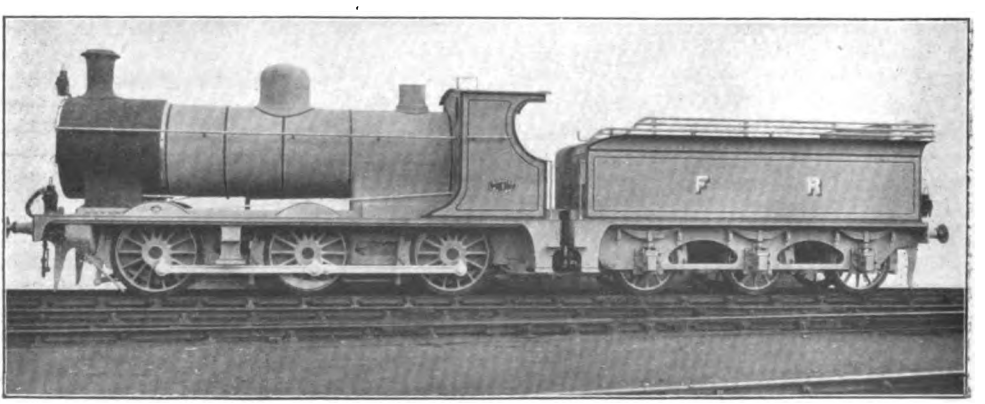
glens, the thickly wooded uplands and the mountains that assume such infinite variety in contour and colour. These have in the past attracted Wordsworth, Southey, Ruskin, Coleridge, Shelley, Mrs. Hemans, Harriett Martineau and many more whose names as *litterateurs* are enshrined in our National annals, and will ever exercise an irresistible fascination upon all who love the beautiful in Nature.

The Furness Company's Locomotive, Carriage and Wagon Works.

The Locomotive, Carriage and Wagon Works of the Furness Railway are situate at Barrow-in-Furness. Sir James Ramsden was at one time Locomotive Superintendent, and afterwards became Managing Director. His successor was Mr. Richard Mason, who, after service extending over 50 years, retired in June, 1897. Under these two gentlemen the workshops were from time to time remodelled and enlarged, and they now occupy an area of about 30 acres. The original locomotive fitting shop and running shed has in later days become the machine shop and turnery. Here are wheel lathes, planing, slotting, drilling, and other machines.

Adjoining is the smiths' shop, with 21 smiths' fires, spring furnace, bolt furnace, forging furnace, plate furnace, and a furnace for heating the tyres for locomotives, carriages and wagons. Next comes the boiler shop, with a 15-ton overhead travelling crane. All the smoke from the plate and forge furnaces, stationary boilers, and smith fires, lead into one large handsome chimney shaft which stands outside the works, in the middle of Salthouse Road. There is also a modern iron and brass foundry in which many special features are seen.

The second running shed is now the erecting shop, which, owing to its low roof,



F. R. SIX-COUPLED GOODS ENGINE.

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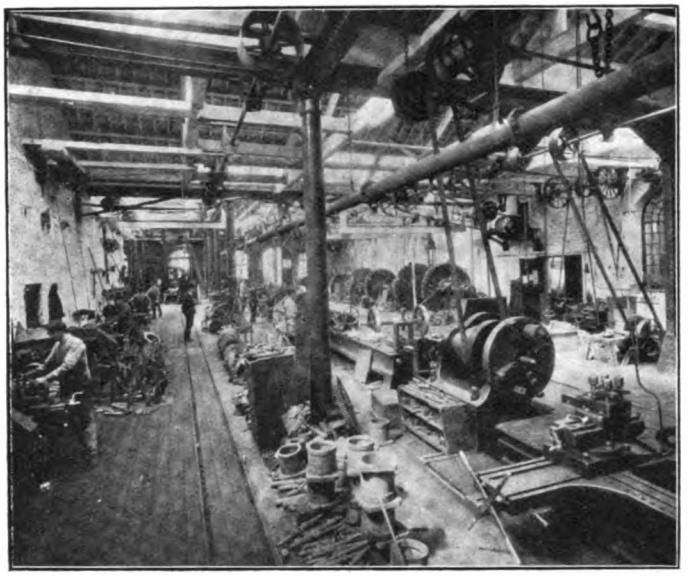
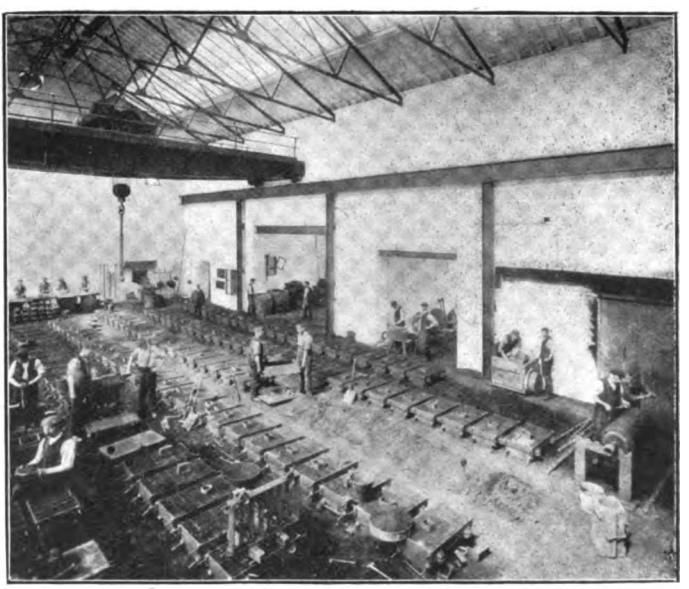


F. R. MACHINE SHOP.

had at one time no overhead crane, the engines having the wheels taken from them, and replaced by means of dropping pits. But one bay has had the roof raised, and an electric overhead crane erected. This shop consists of three bays, each 50 ft. span and 160 ft. in length. It contains six roads, with engine pits, accommodating four engines on each road. Adjoining are the spare gear stores (wherein finished cylinders, axles, and motion gear are kept), the coppersmith and tinsmith shop, and the engine weighbridge table. The present running shed is a fine stone building, 310 ft. long by 150 ft. wide, capable of holding 60 engines.

Coming to the locomotives, a photograph is attached of one of the new six-wheel coupled goods engines designed by Mr. W. F. Pettigrew, the present Locomotive Superintendent. Four of these locomotives have been recently built for the Furness Company. The cylinders are 18 in. diameter, with a stroke of 26 in., and the wheels are 4 ft. 7½ in. in diameter. Total wheel base of engine and tender is 39 ft. 4½ in., and total weight in working order 82 tons. Steam pressure is 170 lbs. per square inch; the total heating surface 1,193 square ft., and the grate area 20·5 square ft. These engines are hauling very heavy loads up gradients nearly four miles long, the inclination of which is 1 in 76, and up another bank of 1 in 63, five and a half miles long, with eight and ten chain curves.

Another photograph shows Mr. Pettigrew's new bogie passenger engine. Its cylinders are 18 in. diameter, with a stroke of 26 in., and are duplicate of those of the six-wheel coupled goods engines. The coupled wheels are 6 ft. diameter, with a leading bogie having wheels 3 ft. 6 in. diameter. Total wheel base of engine and tender is 44 ft. 11½ ins., and the total weight in working order 83 tons 3 cwts. Steam pressure is 170 lbs. per square inch, the total heating surface 1,193 square ft., and the grate area 20·5 square ft. These engines are taking the place of the four-coupled engines, with cylinders 16 in. diameter and



F. R. IRON FOUNDRY.

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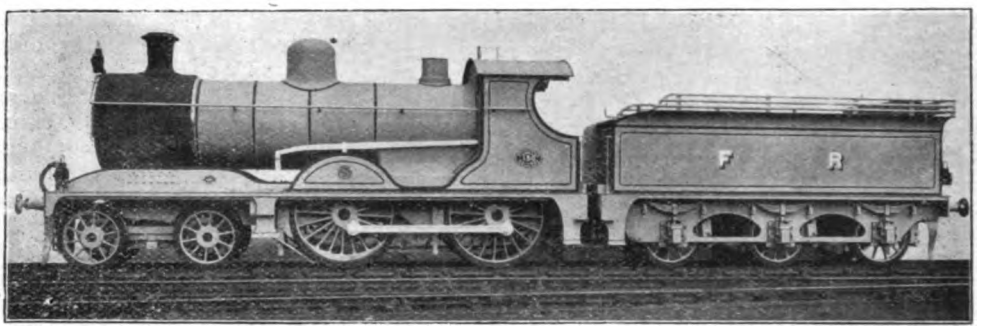
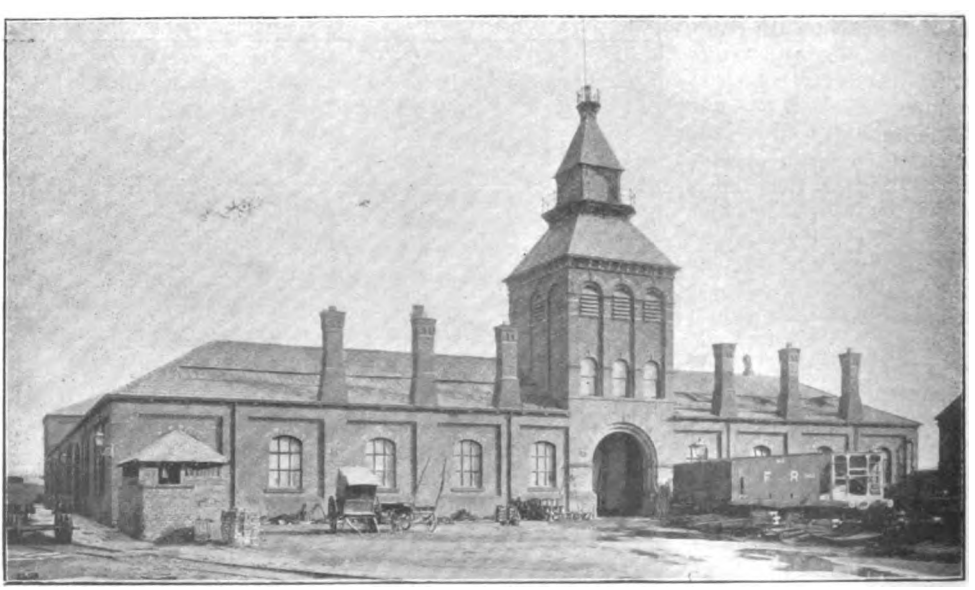


F. R. BOGIE PASSENGER ENGINE.

20 in. stroke, having a total heating surface of only 910·5 square ft., and boiler pressure 120 lbs. per sq. in., the heavy loads and quicker speeds of the present day being too much for engines of the latter dimensions. The Furness Railway Company now possess 132 engines. For very many years the engines have been painted a rich dark crimson—a colour which has become more familiar since the Midland Company adopted the same as its locomotive colour.

Well-laid out, the carriage and wagon shops at Barrow are capable of building all the carriages and wagons required by the Company. The wagon shop, 300 ft. long by 160 ft. in width, consists of carriage body shop, carriage underframe, wagon building, wheelwrights' and machine shops and saw-mill, trimming and joiners' shops being on an upper storey. Capable of holding 20 coaches, the carriage paint shop is 210 ft. long by 80 ft. in width. There is also a wagon repairing shop and a timber drying shed. In addition to a very fine stock shed 403 ft. long, with six roads, in the works yard, carriage stock sheds are established near Barrow Central Station. There are four sheds—one 300 ft. long by 90 ft. in width; one 300 ft. long by 80 ft.; one 255 ft. long by 80 ft.; and one 240 ft. long by 80 ft. capable of holding 152 carriages.

There is also a shed for receiving the saloon carriages. There are some third class bogie carriages (49 ft. long and 8 ft. 6 in. wide) now being built from Mr. Pettigrew's designs. The upholstering and fitting-up of the inside of these carriages is very handsome and comfortable, and like the



Arthur Hollis] [*Barrow-in-Furness.*

F. R. CARRIAGE AND WAGON WORKS.

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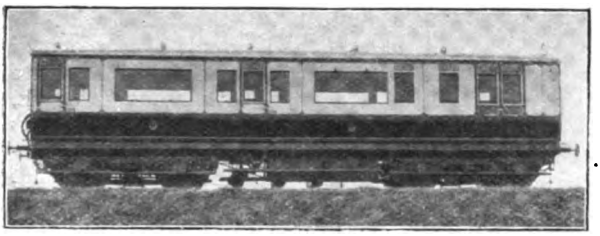


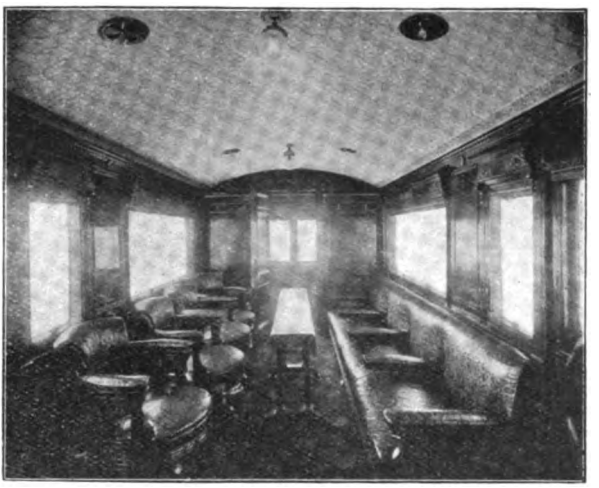
F. R. NO. 1 SALOON.

rest of the carriage stock, they have an electric light installation. All the carriages on the railway have the bodies painted ultra-marine blue, with white upper panels, which produce a very imposing appearance. These colours were adopted soon after Mr. Alfred Aslett became General Manager of the Furness Railway, in 1895. Both first and third class coaches are decorated inside with photographs of celebrated spots in Lakeland, and fitted with a passenger alarm-signal to driver and guard.

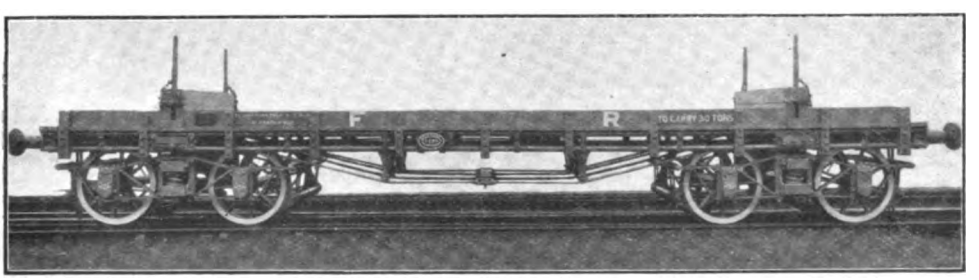
Bogie Mineral Wagons.

Turning to the goods and mineral vehicles of the Company, one of the chief features is at once seen to be the large number of bogie wagons used. Some of these are 40 ft. long, and, while weighing only 10 tons, are capable of carrying 30-ton and 40-ton loads, the ratio being as low as 20 per cent. of dead weight to carrying load. Most of these wagons are employed for carrying rails from the various steel works on the system. Recently bogie wagons of pressed steel have been introduced for conveying iron ore. Each wagon carries 45 tons of ore from the mines and docks to the iron works round Barrow, the tare of the wagons being 12 tons 15 cwts., or only 22 per cent. of the gross weight. The use of such wagons is a move in the right direction, as the ordinary British coal and ore wagons carry from 7 to 10 tons only, while the tare is 6 tons or more. In those cases the tare is over 37 per cent. of the dead weight, in comparison with 20 per cent. in the case of the Furness bogie wagons. Indeed, some private traders' wagons are running on British railways carrying 10 ton loads, with the tare actually exceeding 9 tons.

Railways in the United Kingdom are much handicapped by the narrowness of the gauge of the rails, as also by the height and width of bridges and tunnels. Other countries on the Continent, as well as India and America, have benefited by our experience in these directions, and have thus been able to make improvements. Here no change in principle has been witnessed, and there has been little alteration in the construction of goods rolling stock during the last 70 years.



F. R. SALOON—INTERIOR.



F. R. 30-TON BOGIE WAGON FOR CONVEYING RAILS FROM THE BARROW STEEL WORKS TO BARROW DOCKS.

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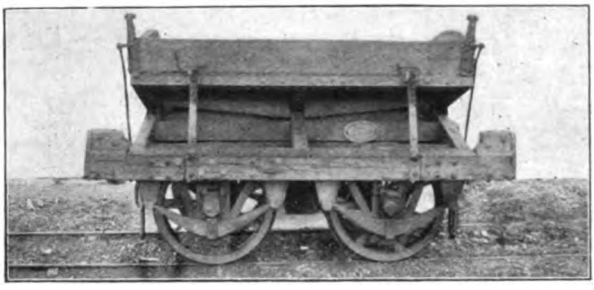

F. R. OLD TIP WAGON.

Much may be said in favour of bogie wagons. They can round sharper curves, are much easier for the permanent way, and the ratio of carrying capacity to dead weight is very much greater. Thus a material decrease in the cost of hauling goods is effected. Smaller siding accommodation is required, as one wagon carrying 40 tons will occupy less room than two wagons containing 10 tons each, or 20 tons in all.

The objection to bogie wagons is that the ordinary turn-tables are not large enough; but as the bogie will run round very sharp curves, turn-tables may in many cases be abandoned. It is stated that the average load of goods per wagon in this country is only 2½ tons, and that consequently there is no need for large wagons to carry 30 tons. But we may often see in Great Britain whole trains of coal, coke, and iron ore in full wagon loads. It is, therefore, evident that the larger wagons could, in such cases, be used with greater advantage and economy. Another objection is that the bogie wagons are too long for the present weigh-bridges. But this drawback could be overcome by another weigh-bridge being placed at a certain distance from those existing, so that one bogie of the wagon could stand on each weigh-bridge, or the wagon weighed one end at a time. In this country the use of the bogie for passenger rolling stock is much appreciated. Modern carriages running on our main lines, like important corridor, luncheon, dining and sleeping cars, are being built with bogies, which add to the comfort of passengers.

An accompanying illustration exhibits the type of tip wagons which have been in use on the Furness Railway for many years, and originally employed for carrying iron ore from the mines for shipment at Barrow Docks. A second photograph shows one of the company's 20-ton "Absolute Discharge" bottom-door wagons, specially designed to fulfil present day requirements, which necessitate a rapid, economical, and, having regard to the stringent character of the Compensation Acts, a perfectly safe method of discharging wagons. These wagons are constructed with straight sides, and in this particular differ from every other type yet seen. The bottom doors occupy the full length of the wagon, and as the sides of the wagon are perpendicular, no obstruction is offered to the dead weight of the load, which is precipitated immediately the catches are released.

Wagons employed elsewhere are built with oblique sides, and usually with two or four bottom doors. The sloping sides impede the precipitation of the load when the bolts are withdrawn, and the limited area occupied by the doors necessitate the employment of men to clear the openings and complete the discharge. It has been found in practice that the time saved by the Furness wagon is about 20 minutes by the two door men, and by the labour of four men —each taking 15 minutes—1 hour per load per wagon. In other words two men will empty one of the new wagons in half a minute, while six men take 25 minutes to empty a wagon of the old type, that is including unfastening and re-fastening the doors. It will thus be seen what great economy could be effected at Iron Works, if all the wagons were built upon this greatly improved system.

The Furness Company now possess no fewer than 7,816 wagons, which, considering its length of line and the goods train miles run, is a very considerably higher number

ABSOLUTE DISCHARGE WAGON, USED FOR IRON ORE.

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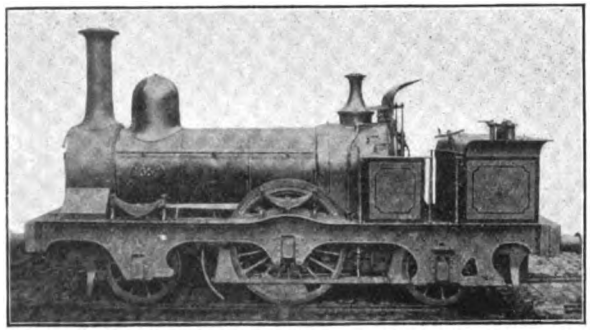
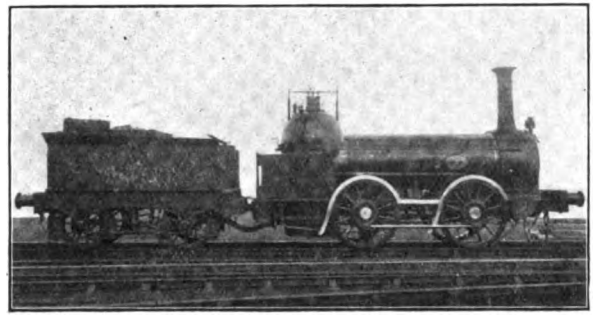
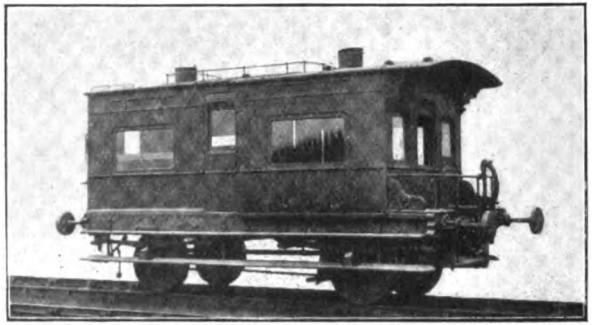


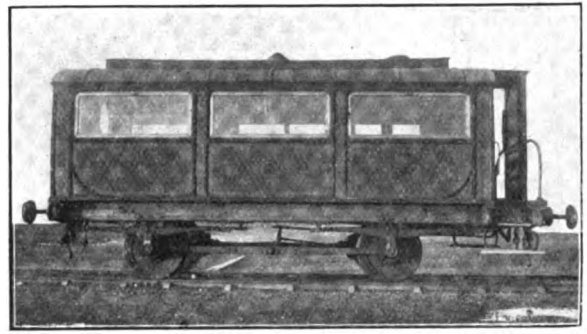
OLD TANK ENGINE, 1866–1896.



OLD "COPPERNOB" LOCOMOTIVE, 1846–1899.
Preserved under cover at Barrow (Central) Station.



OLD INSPECTION CAR.



THE LATE DUKE OF DEVONSHIRE'S OLD SALOON.

FURNESS RAILWAY: HISTORICAL STOCK.

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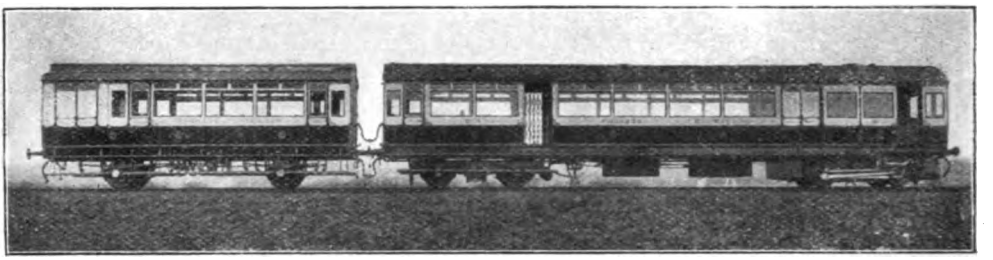
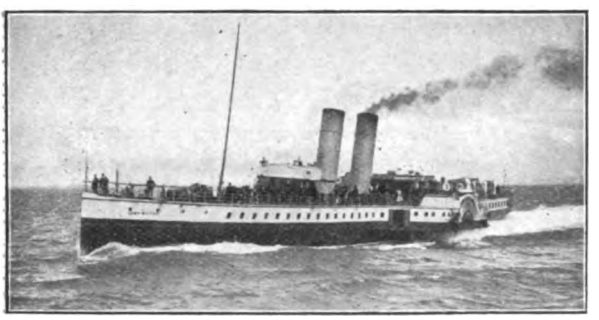


F. R. RAIL-MOTOR AND TRAILER.

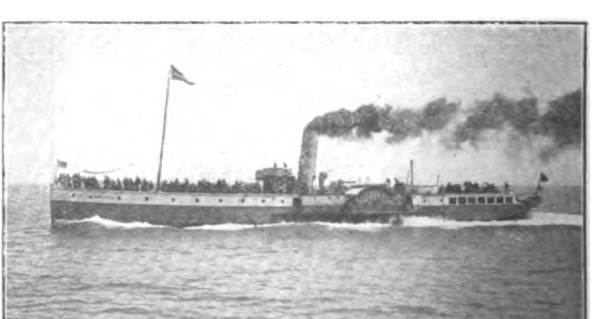
than the average on British lines. It must, however, be mentioned that for the six months ending, December 31st, last, 353,123 tons of goods and 1,889,768 tons of minerals—consisting of coal, coke, and iron ore—were carried over the system. In addition to the works and sheds at Barrow, the Company also have locomotive shops and sheds



F. R. PADDLE-WHEEL STEAMER *Lady Moyra*; BARROW AND FLEETWOOD SERVICE.

and wagon repairing shops at Carnforth—where the junction joins the London and North Western and Midland Railways—and also at Moor Row. At the latter place are stationed the locomotives that work the London and North Western and Furness Joint Railway, which runs from Sellafield and Whitehaven to Cleator Moor; as well as the locomotives, carriages, and wagons which it works on the Cleator and Workington Junction Railway, running from Cleator Moor to Siddick. There are likewise engine sheds at Whitehaven, Coniston and Lake Side, where the engines working those branches are stationed.

In addition to the locomotives, carriages, and wagons, the steam yachts on Lakes Windermere and Coniston (including the mechanical work of the steam tugs, dredgers, and barges of the Harbour Department and the cranes) are under the superintendence of the Locomotive Engineer. The six steam yachts on Lake Windermere for passengers — *Swift*, *Swan*, *Tern*, *Teal*, *Cygnet*, and *Britannia* — are models of elegance and comfort, the *Swift* which is the largest, being 110 ft. in length and 21 ft. beam, carrying 781 passengers. All these yachts have twin screws, and start from Lake Side Station Pier—where the trains run alongside the steamers—to the various piers on the lake, terminating at Ambleside, where in summer most of the road vehicles begin the many coach and steam yacht tours which are so much appreciated by visitors to Lakeland. There is also a screw steamer running on Lake Windermere for merchandise and heavy goods. The company have four tugs, two dredgers, five steam barges, and two up-to-date paddle-wheel steamers — *Lady Evelyn* and *Lady Moyra* — carrying passengers between Barrow and Fleetwood for Blackpool. This service enables many thousands of people who stay at these popular seaside resorts to visit the lovely Lakeland of England, and, as a matter of fact, about 150,000 passengers are carried every season.



F. R. PADDLE-WHEEL STEAMER *Lady Evelyn*; BARROW AND FLEETWOOD SERVICE.

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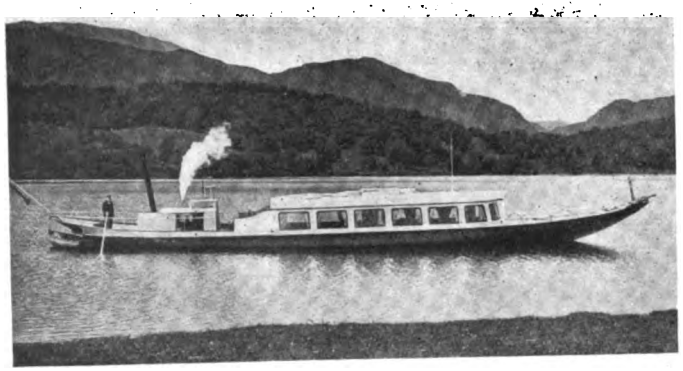
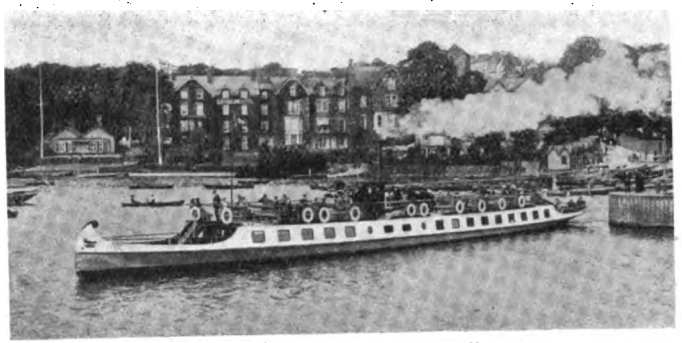
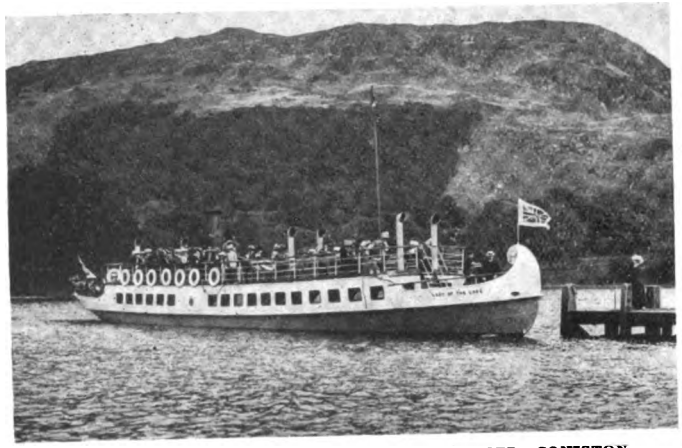


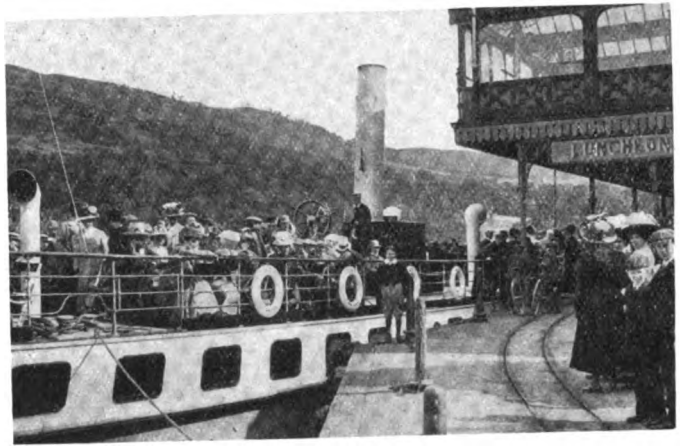
S. Y. *Gondola ;* CONISTON LAKE.



S. Y. *Tern,* IN BOWNESS BAY.



S, Y. *Lady of the Lake* AT LAKE BANK PIER, CONISTON.



S. Y. *Swift* AT LAKE SIDE PIER, WINDERMERE.

FURNESS RAILWAY STEAM YACHTS, USED FOR LAKE TRAFFIC.

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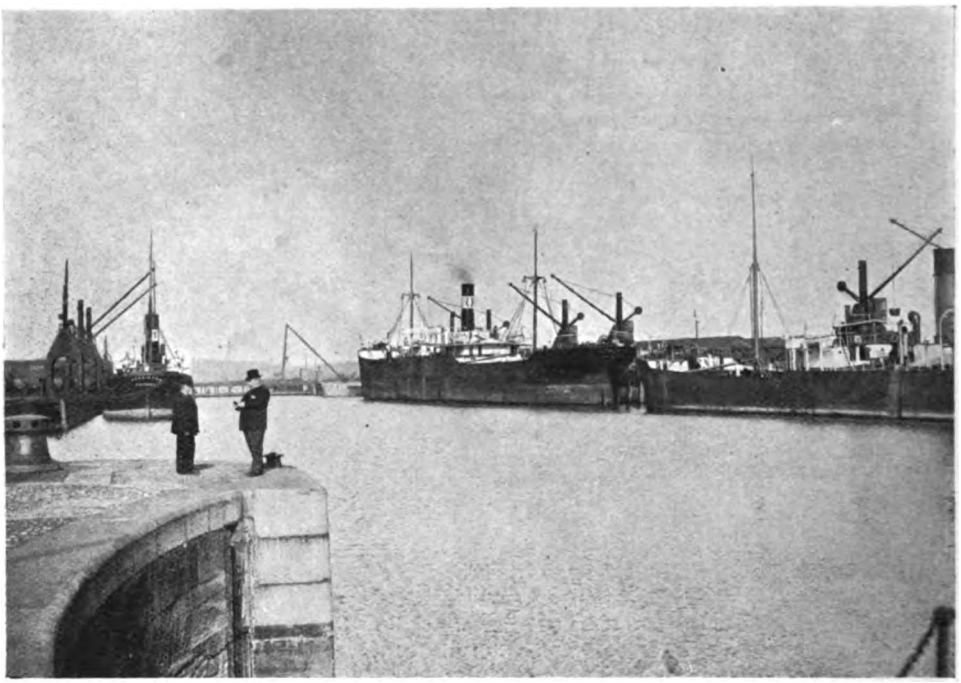

RAMSDEN DOCK BASIN.

Barrow Docks.

The Barrow Docks, which are the property of the Furness Railway Company, consist altogether of 299 acres, and are equipped with a large number of hydraulic and steam cranes, the capacity ranging from 30 cwts. to 120 tons. There are three main docks—the "Devonshire," "Buccleuch," and "Ramsden" all communicating with each other, and comprising 131½ acres of water space. There are two entrances with tidal basins to each—one into the Ramsden Dock, which is situate two miles north of Roa Island, and is approached from Walney Channel—the other into the Devonshire Dock, further north than the Ramsden Dock entrance, and also approached from Walney Channel.

FURNESS RAILWAY TUGS, RAMSDEN DOCK.

Ramsden Dock Basin, of 8 acres, has four deep-water berths provided with hydraulic cranes and sidings. The entrance, 100 ft. wide has a depth on the cill of 31 ft. 6 in. at H.W.O.S. and of 24 ft. at H.W.O.N. The Lock is 700 ft. long by 100 ft. wide, and the inner cill is the same level as Ramsden

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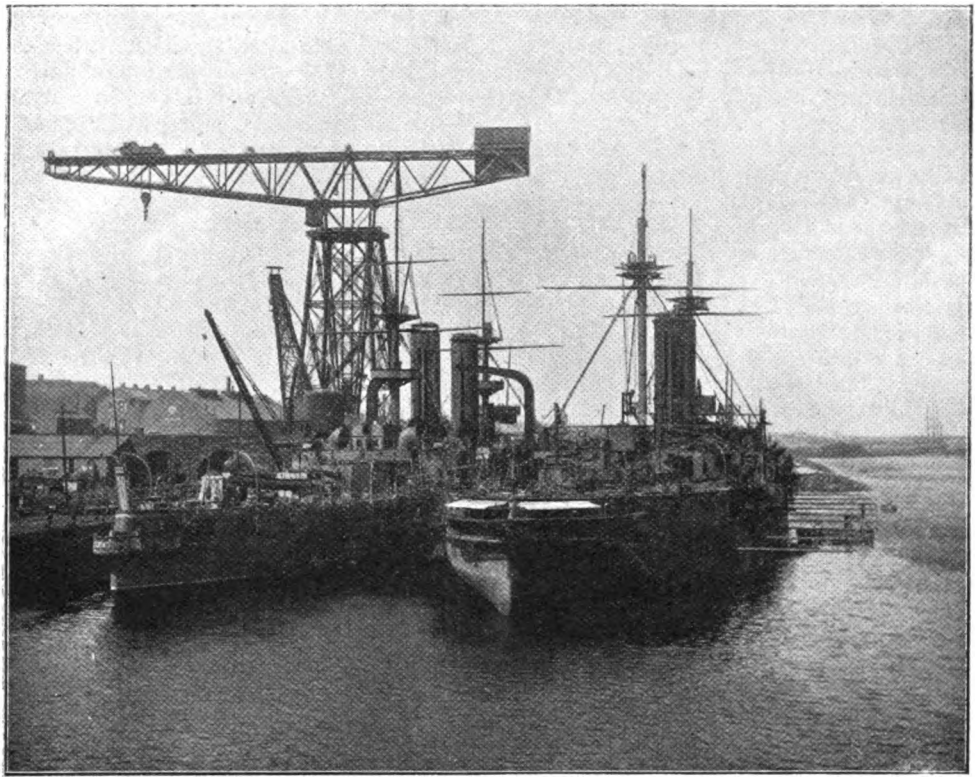
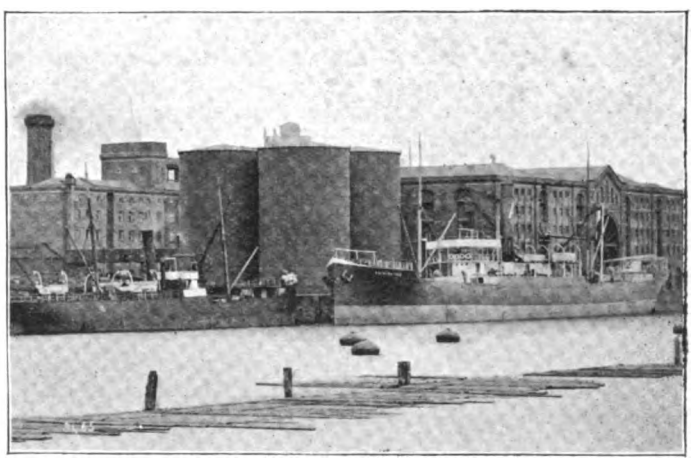


H.M.S. *Triumph* and *Dominion*; DEVONSHIRE DOCK.

Dock entrance. There is a fairway or channel dredged to a depth of 28 ft. 3 in. (when there is 30 ft. of water on No. 4 Ramsden Dock cill) through the Ramsden, Buccleuch and Devonshire Docks to the 150-ton crane in the Devonshire Dock. The same channel also affords communication with a deep-water berth 30 ft. in depth alongside the fitting-out quay and 150-ton crane of Messrs. Vickers Limited, in the Buccleuch Dock.

The Ramsden Dock has an area of 60 acres, an entrance 100 ft. wide, with a depth of 31 ft. 6 in. on the cill at H.W.O.S., and 24 ft. at H.W.O.N. This dock and its quays are electrically lighted throughout. On the Devonshire Dock cill there is 6 ft. less water, and the entrance is 60 ft. wide. Along the quays are warehouses, cattle sheds, grain sheds, hydraulic and steam cranes, with every necessary facility for quick loading and discharging. In addition to these cranes there are in the Devonshire Dock a 150-ton electric crane, a 90-ton



GRAIN WAREHOUSE, SILOS AND ELEVATOR: DEVONSHIRE DOCK.

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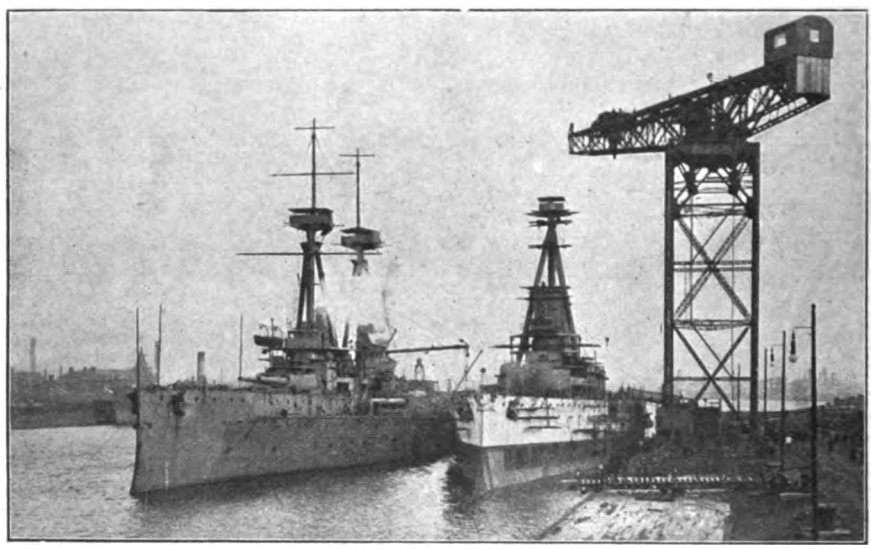
hydraulic crane, and a 30-ton steam crane; in the Buccleuch Dock a 150-ton electric crane; and in the Ramsden Dock a 10-ton hydraulic crane, while in the Ramsden Dock Lock there is a 25-ton sheer legs. On the West side of Ramsden Dock is the Anchor Line Basin, where the quays are long enough to accommodate eight large steamers. Commodious sheds have been erected on the dock quays throughout the whole of their southern length.

Cavendish Dock, which has an area of 146½ acres (situate north-eastward of Ramsden Dock), is leased to Messrs. Vickers, Limited, for the construction and manœuvring of airships and rigid dirigibles, now an important branch of industry; but during spring and neap tides it also serves as a feeder to the other docks. From the entrance gates northward, quays for the accommodation of the Midland Railway Company's vessels, which run tri-weekly between Barrow and Belfast, have been constructed, including an additional pier for the accommodation of the Furness Railway Company's steamers plying, during the summer months, between Barrow and Fleetwood. There is sufficient depth of water to enable the steamers to reach the quays and lie afloat at any state of the tide. A deep-water berth has been provided in Walney Channel between the Fleetwood Passenger Pier and the Harbour Yard Pier, 850 ft. long and 100 ft. wide, with a depth of water at L.W.O.S. of 33 ft. On the south side of Ramsden Lock and Basin is situate a cattle wharf, with a chill room and other accommodation, capable of keeping 300 cattle and 100 sheep carcases. Petroleum storages, holding 34,520 tons of oil, have been provided. The installation includes all necessary cooperages, barrelling sheds and stacking grounds for ordinary petroleum oil and petroleum spirit.

The Buccleuch Dock, of 31 acres, is entered from the Ramsden Dock, by an entrance 100 ft. in width. It also communicates with the Devonshire Dock by an entrance 80 ft. in width. The Buccleuch Dock along the west side (and on a portion of the east side) has a wooden or piled wharf, which abuts on Messrs. Crossfield & Co.'s timber yards and saw mill, and on Messrs.



H.M.S *Princess Royal* and BRAZILIAN BATTLESHIP *Sao Paulo*: BUCCLEUCH DOCK.

Vickers' fitting-out quay for warships and other large vessels, where the 150-ton electric crane has been erected. Devonshire Dock, of 32½ acres, in addition to the above mentioned entrance from Buccleuch Dock, has a tidal basin and an opening into Walney Channel 60 ft. wide. On the west side of this dock are Messrs Vickers' works and a depositing dock capable of lifting vessels of 3,000 tons displacement in about 35 minutes. The dock was constructed on Messrs Clark & Stanfield's system, and in connection therewith is a fixed staging on which vessels may be deposited. The process of lifting, sighting, and refloating can be completed in two hours, or a ship may be raised, cleaned, painted, and lowered

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again into the water in twenty-four hours.

Vessels can be docked upon an uneven keel. Every process in docking and undocking is done more promptly than in an ordinary graving dock, and is independent of tides, so that any painting or repairing is done in the dry, with plenty of light. The promptitude and despatch with which repairs can be executed on the dock, as compared with an ordinary graving dock, have been much appreciated by shipowners. This dock may be seen at work at any time in the Devonshire Dock. The timber yard and newly-constructed creosoting works of Messrs Burt, Boulton & Haywood, Limited, are also on the west side of the Devonshire Dock, and the extensive corn mills, warehouses and grain silos of Messrs Walmsley & Smith on the East side, with a berth dredged to a depth of 24 ft., for the accommodation of vessels importing grain for that firm.

There is a spacious Graving Dock to the north-east of the Devonshire Dock Basin, capable of holding a vessel 5,500 tons. The length of this dock is 500 ft., the entrance is 60 ft. wide, and the depth of water on the cill 9 ft. less than that at the Ramsden Dock entrance. Pumps for emptying the dock are worked by hydraulic power. The Furness Railway Company have dredged a channel through Piel Bar to a minimum width of 200 ft. (for a distance of 3,650 ft.) and a maximum width of 300 ft. for a distance of 13,500 ft. towards the sea), and 12 ft. deep at L.W.O.S. Further dredging costing about £70,000 is in progress in Walney Channel and on Piel Bar, and this, when completed, will greatly improve the fairway, enabling the largest vessels afloat to enter and leave the harbour and docks in absolute safety. A new deep-water berth was last year constructed in the Walney Channel, close to the Ramsden Dock entrance. This work, which involved an expenditure of nearly £35,000, enables the largest vessels afloat to be safely moored at the berth, either when being undocked or when arriving at the port of Barrow.

The Anchorage at Piel is safe and easy of access, but is not available at L.W.O.S. for long, heavy-draft steamers. A bridge has been erected by the Barrow Corporation between Barrow and Walney Island across Walney Channel, about 400 yards south of Devonshire Dock entrance. The opening span through which vessels have to pass is 120 ft. wide, and the bridge is well lighted at night. Dolphins or jetties 250 ft. in length have been provided on each side of the opening span for the safety of vessels when passing through the bridge. Commander C. Bissett, R.N., the Harbour Master, is solely responsible for the berthing, towing and movement of all vessels in the docks.

Some splendid sites are still reserved for the erection of new works, the land actually available for that purpose being 127¾ acres. The total area of land and water comprised within the port is, therefore, 427 acres, and one more compact or conveniently designed for quick loading and discharge it would be difficult to discover. Space which can be utilised for business purposes forms 21 different plots, and the following table shows the area and accommodation available in each case:—

Site No.	Area.	Accommodation.
1	5½ Acres	Rail
2	2 ,,	Rail
3	3¾ ,,	Rail
4	7½ ,,	Rail
5	5½ ,,	Rail
6	3 ,,	
7	4 ,,	
8	2 ,,	Rail and Water
9	¼ ,,	Rail and Water
10	5¾ ,,	Rail and Water
11	4 ,,	Rail and Water
12	12¼ ,,	Rail
13	2¾ ,,	Rail
14	2½ ,,	Rail
15	10 ,,	Rail and Water
16	¾ ,,	Rail and Water
17	3 ,,	Rail and Water
18	15¼ ,,	Rail and Water
19	28¾ ,,	Rail
20	7½ ,,	Rail
21	1½ ,,	Rail and Water
Total Area	127¾ Acres	

The facilities of the docks enable the shipper or merchant to load his goods direct from the ship, and to send them at the cheapest rates to any part of England or Scotland. Owing to the sheltered position behind Walney Island, there is a considerable rise and fall of the tide, and large vessels, including merchant steamers, battleships and cruisers, have been successfully docked and undocked, the dimensions of the largest vessel being: Length, 704 ft.; beam, 92 ft. 0¾ in.; draft 25 ft. 10 in.; 27,500 tons displacement. Of the 21 sites still available, 9 have both rail and water accommodation, and 10 rail facilities. Two are about 2,000 yards removed from such advantages, but any communication desired could be provided by mutual arrangement. Among the companies and

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firms who have already established premises on the dock estate are the following:—Anglo-American Oil Company, Limited; Asiatic Petroleum Company, Limited; Barrow Hematite Steel Company, Limited; Burnip and MacDougall, Limited; Burt, Boulton, and Haywood, Limited; British Petroleum Company, Limited; F. J. Crossfield and Co.; Isle of Man Steam Packet Company, Limited; Kellner-Partington Paper Pulp, Company, Limited; Producers Petroleum Company, Limited; Vickers, Limited; and Walmsley and Smith's Steam Corn Mills.

Mr. Aslett has favoured me with the following statement, prepared in the Audit Department, showing the remarkable growth in the Company's passenger traffic compared with the year 1870 and also 1895:—

The undermentioned figures exhibit the enormous merchandise tonnage in nine different years since 1870:—

Year.	Tonnage.
1870	3,067,723
1890	4,829,377
1895	3,517,359
1899	4,836,573
1900	4,787,831
1907	4,282,782
1908	3,338,914
1910	4,298,963
1912 (Coal Strike) ..	3,935,370

Barrow is 35 miles from Lancaster, 91 from Carlisle, 84 from Liverpool, 87 from Manchester, and 266 from London. It is served by five stations on the Furness Railway, which encircles the greater part of the borough.

Year.	No. Passengers (Exclusive of Steam-Boats).	Receipts.						
		Passengers.	Parcels, Horses, Carriages, &c.	Mails.	Total.	Walney Ferry.	Steam-Boats.	Grand Total.
		£	£	£	£	£	£	£
1870	978,830	46,372	4,721	2,000	53,093	—	4,890	57,983
1890	2,065,060	87,164	13,494	3,236	103,894	559	8,263	112,716
1895	2,134,353	85,055	13,484	3,255	101,794	574	9,599	111,967
1896	2,270,065	88,714	14,081	3,255	106,050	642	9,900	116,592
1897	2,338,916	90,436	14,913	*8,285	113,634	733	9,970	124,337
1898	2,468,062	95,413	15,295	6,055	116,763	725	10,350	127,838
1899	2,684,021	103,508	16,801	6,062	126,371	852	10,962	138,185
1900	2,801,324	109,665	16,830	6,062	132,557	1,282	10,876	144,715
1901	2,880,634	113,558	17,472	‡7,872	138,902	2,486	12,856	154,244
1902	2,920,235	114,252	17,550	7,062	138,864	3,541	13,200	155,605
1903	2,978,458	115,607	17,611	7,062	140,280	3,991	14,885	159,156
1904	2,968,459	112,829	17,798	7,062	137,689	3,747	16,004	157,440
1905	2,906,418	109,780	17,748	7,062	134,590	3,498	17,233	155,321
1906	3,106,139	115,599	18,427	7,062	141,088	3,308	19,463	163,859
1907	3,123,082	115,985	18,547	7,062	141,594	2,613	18,226	162,433
1908	2,972,753	110,460	17,671	7,062	135,193	1,427	15,866	152,486
1909	2,878,343	105,178	17,653	7,062	129,893	†	16,416	146,309
1910	3,068,982	111,309	18,415	7,062	136,786	—	18,219	155,005
1911	3,207,622	115,538	19,809	7,062	142,409	—	20,198	162,607
1912	3,265,844	119,314	19,946	7,062	146,322	—	19,250	165,572
	No.	£	£	£	£		£	£
Increase 1912 over 1870	2,287,014	72,942	15,225	5,062	93,229	—	14,360	107,589
Increase 1912 over 1895	1,131,491	34,259	6,462	3,807	44,528	574	9,651	53,605

† Walney Ferry ceased to run from August 1st, 1908, on the opening of Walney Bridge.

* Includes £2,230 for retrospective payment.

‡ Includes £810 for retrospective payment.

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DIRECTORS AND CHIEF OFFICERS:

THE DUKE OF DEVONSHIRE, CHAIRMAN:

The Furness Railway is honoured in having as its chairman the head of one of the most universally respected families in England, whose ancestry dates back for over 300 years. Nephew of the late Duke—who, as the Marquess of Hartington, took such an active part in opposition to the Home Rule Bill of his leader Mr. Gladstone—Victor Christian William Cavendish, his successor, is an excellent man of business. It was on this account that he was, when a member of the House of Commons, appointed to the extremely exacting office of Financial Secretary to the Treasury, after discharging the lighter duties of Treasurer of the House-

THE DUKE OF DEVONSHIRE, G.C.V.O.
Chairman, Furness Railway Company.

hold. He occupied the former position two years, and during that time showed a familiarity with the public accounts which astonished a good many members. Like his predecessor, the Duke undertakes a wide range of duties, and finds time to perform

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all his work in a most conscientious manner. His Grace is a large landowner in Cumberland, Derbyshire, Yorkshire, Sussex and County Waterford, and elsewhere. He is Lord Lieutenant of Derbyshire, President of its Territorial Force, Chancellor of Leeds University, and chairman of the Barrow Hematite Steel Company. Joining the Board of the Furness Railway in 1891, he became chairman, in 1908, on the death of his uncle, and evinces the keenest interest in its business and development.

LORD MUNCASTER, DEPUTY CHAIRMAN.

The Right Hon. Lord Muncaster, the Deputy Chairman, who was born on Christmas Day, 1834, is the Lord Lieutenant of Cumberland, President and Chairman of the County Territorial Force Association, and the owner of about 15,000 acres of land and minerals in Cumberland and Lancashire. After leaving Eton, as Josslyn Francis Pennington, he obtained a captaincy in the 90th Light Infantry, and served in the Crimea from 1854 to 1856. Engaged in the trenches and in two attacks made by storming parties on the Redan, he received the medal and clasp, as well as the Turkish medal. Subsequently Mr. Pennington accepted a captaincy in the Rifle Brigade, and is Hon. Colonel of the 5th Batt. Border (Territorial) Regiment. He succeeded his brother, the fourth baron, in 1862, and ten years later was elected to the House of Commons as Conservative member for West Cumberland, for which constituency he sat until 1880, and at a later period—from 1885 to 1892—represented the Egremont division of Cumberland. In 1898 he was created a baron of the United Kingdom—the earlier barony having been Irish—and in 1890 joined the Board of the Furness Railway Company, of which, since 1908, he has been Deputy Chairman. His residence is at Muncaster Castle, Cumberland, beautifully situated in the Eskdale valley. His heir the Hon. Alan Pennington, died in June, 1913.

RIGHT HON. LORD MUNCASTER, Deputy Chairman.

MR. ALFRED ASLETT, SECRETARY AND GENERAL MANAGER.

Mr. Alfred Aslett, the Secretary and General Manager, has had a longer experience as General Manager than any of his colleagues on British railways. Much of the growth of the Furness Railway business, particularly in the passenger traffic, is undoubtedly due to his exertions. A Yorkshireman by birth, his father was a District Superintendent of the Great Northern Railway, and previously the Secretary to Mr. George Hudson, "The Railway King." Mr. Aslett was educated in his native city, York, and also at Peterborough Grammar School, to which he has this year presented a silver challenge cup for cricket competition by the several houses of the King's School. He began his long, active and successful railway career by entering the service of the Great Northern Railway in 1862. After ten years' experience at Nottingham and other stations, he was transferred to the Audit Office at King's Cross, where he occupied a prominent position for a further period of ten years. In 1881 he was appointed Chief Accountant of the Eastern and Midlands Railway in Norfolk, and in 1884 became Manager of that line—now known as the Midland and Great Northern Joint Railway—with headquarters at King's Lynn.

In the year 1877 Mr. Aslett married Emma Mary, the only daughter of the late Edward Francis Rimbault, LL.D., who wrote the history of the pianoforte and

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MR. ALFRED ASLETT—1886.
Eastern and Midlands Railway.
(Now Midland & G.N. Joint).

also of the organ in collaberation with Dr. Hopkins. In 1891 he succeeded the late Mr. John Conacher as Secretary and General Manager of the Cambrian Railways. On leaving the Eastern and Midlands Railway, Mr. Aslett was presented with a silver tea service and salver by the staff of the line. Mr. and Mrs. Aslett were also presented with a Beckstein grand piano and music cabinet by their numerous friends in Norwich, Yarmouth, and King's Lynn. After being four years with the Cambrian Railways—during which period Mr. Aslett developed to a remarkable extent the passenger traffic on that line—he was offered and accepted in the autumn of 1895, the post of General Manager on the Furness Railway. On his retirement from the Cambrian service he was entertained at a banquet by the town of Aberystwyth, who presented him with a magnificent bronze Japanese lamp. It is probably unique for an Englishman to receive such a token of respect from the Northern section of the Welsh people. Mr. Aslett was also presented by the Cambrian Railway staff, with a handsome silver table centre-piece, with silver fruit dishes and lamps.

In the months of October, November and December, 1911, and January, 1912, Mr. Aslett visited India and Egypt for the purpose of seeing the working of the Indian and Egyptian Railways and attending the Coronation Durbar at Delhi. For a period of four years, from February, 1908, to February, 1912, Mr. Aslett was President of the Barrow Chamber of Commerce. As the representative of that Chamber, he crossed the Atlantic in September, 1912, and attended the Fifth International Congress of Chambers of Commerce held at Boston (Mass.). To commemorate these visits to the East and West, he entertained at the Furness Abbey

MR. ALFRED ASLETT—1912.
Furness Railway
(Campbell's Studio, New York).

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Hotel, on the 30th January last, as already reported in the RAILWAY MAGAZINE, a party of about sixty gentlemen, members of the Barrow and other Chambers of Commerce. He then gave an interesting account of his foreign travels, the American portion of which represented a total distance of about 10,000 miles. This, added to the 20,000 miles to and from the East, made 30,000 miles in a little over twelve months.

Mr. Aslett has been a Freemason for many years, and is a Past Provincial Grand Warden of West Lancashire. He has been a Steward at the Annual Festivals for the Masonic Institution for Girls and also for Boys; he is a Justice of the Peace for the Borough of Barrow-in-Furness, and Chairman of the Furness and Barrow Branch of the Royal Society for the Prevention of Cruelty to Animals. Mr. Aslett resides at Stanyan Lodge, Ulverston, and is a member of the County Club, Barrow-in-Furness, the North Lonsdale Club, Ulverston, and of the National Liberal Club.

Mr. Aslett has always been an ardent cricketer, and possesses a cricket ball mounted on a silver stand; on which is inscribed :—

G. N. R.

Married *v.* Single,

1874.

Hitchin.

4 Wickets with 4 Successive Balls.

He is one of the enrolled members of the National Reserve, and was for some years a member of the well-known Nottingham "Robin Hood" Volunteers. During Mr. Aslett's connection with the Midland and Great Northern Joint, Cambrian, and Furness Railways he has been instrumental in arranging for the officers and salaried members of those staffs to be associated with the Railway Clearing System Superannuation Fund Corporation.

MR. D. L. RUTHERFORD, ENGINEER.

Mr. D. L. Rutherford, the Engineer of the company, served his apprenticeship on the North British Railway, and during the reconstruction of Waverley station, Edinburgh, carried out the rearrangement of the complicated point and crossing work in connection therewith. In 1905 he was promoted chief assistant in the New Works Department, and for two years was engaged in a number of important widenings and new stations. Two years later Mr. Rutherford became district engineer of the northern division of the railway, comprising the Tay Bridge, Methil, Alloa and Fifeshire harbours, and in 1909 was appointed to his present position of Engineer to the Furness Railway Company. In 1912 he served as President of the Permanent Way Institution, maintaining a keen interest in the welfare of the institution, presiding on many occasions at sectional meetings, and at the summer convention, held in Barrow in July, 1912, endeared himself to the visiting members by the kindly interest he took in the success of the convention.

MR. W. F. PETTIGREW, LOCOMOTIVE, CARRIAGE AND WAGON SUPERINTENDENT.

Mr. Pettigrew was articled as a pupil to Mr. William Adams, M.I.C.E., when that gentleman was Locomotive, Carriage and Wagon Superintendent of the Great Eastern Railway at Stratford. Upon the removal of Mr. Adams to the London and South Western Railway, Mr. Pettigrew completed his pupilage under the late Mr. Massey Bromley, passing through all the shops, running department, and drawing office, afterwards to enter the office of the Works Manager as an assistant. When Mr. T. W. Worsdell, M.I.C.E. joined the Great Eastern Railway as Locomotive Superintendent, he appointed Mr. Pettigrew Assistant Manager of the Locomotive, Carriage and Wagon Works at Stratford. Mr. Pettigrew continued in that position, under Mr. Worsdell and Mr. James Holden, until appointed by the directors of the London and South Western Railway Manager of their works at Nine Elms, and assistant to his old chief Mr. William Adams. In 1897 he was selected by the directors of the Furness Railway for the position of Locomotive, Carriage, and Wagon Superintendent, which he has now filled for 16 years. Mr. Pettigrew is a member of the Institution of Civil Engineers, a member of the Institution of Mechanical Engineers, and a member of the Iron and Steel Institute. In 1896 he was awarded by the Council of Institution of Civil Engineers the George Stephenson Medal and Telford Premium for his paper on "Trials of an Express Locomotive." He is also the author of "A Manual on Locomotive Engineering," published in 1899, which has become a standard work on that important subject.

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MR. D. L. RUTHERFORD,
Engineer.

MR. W. F. PETTIGREW,
Locomotive Superintendent.

MR. T. JACKSON.
Goods Manager.

MR. A. A. HAYNES,
Superintendent of the Line.

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Mr. T. Jackson, Goods Manager.

Mr. Jackson's whole railway career has been devoted to the Furness Company. He joined the service in 1873 as a junior clerk, and, after serving at several stations, was promoted to the Audit Office, where he acted first as relief station auditor, and then as assistant station auditor. From the Audit Office he went to the Traffic Manager's Office, the traffic business being then confined to one office. On the separation of the goods and passenger work in 1890, the late Mr. Mossop became Goods Manager, and selected Mr. Jackson as his personal assistant. In that position the latter had much to do with matters arising under the Railway and Canal Traffic Act and the Railway Rates and Charges Confirmation Act, 1892. He also acquired a complete knowledge of the Furness Railway and its business, which eminently qualified him for the position of Goods Manager, to which he was appointed in 1907.

Mr. A. A. Haynes, Superintendent of the Line.

Mr. A. A. Haynes entered the service of the Furness Railway Company in 1884 as Junior Clerk in the Traffic Manager's Office. He afterwards became Chief Assistant to the Superintendent of the Line, and, upon the retirement of Mr. F. J. Ramsden in 1908, when the latter was elected to a seat on the Board, succeeded to that office.

Mr. John Telford, Accountant.

Mr. Telford joined the Furness Railway Company's service as booking clerk at Barrow Station in October, 1869, and in March, 1871 was transferred to the Audit Department. Seven years later he entered the Accountant's Department, and in October, 1899, was appointed Chief Clerk. This position he held until the 1st of January last, when he received his present appointment.

Mr. W. Brockelbank, Audit Accountant.

Mr. William Brockelbank, the Audit Accountant, a native of the Valley of Whicham, in South Cumberland, was educated at the old Whicham and Millom Grammar School, near Silecroft. After leaving school he was, in the early part of 1861, appointed by the Railway Clearing House a number-taker at Ulverston, which was then the Junction of the Furness and Ulverston and Lancaster Railways. There he remained until the Clearing House Office at the Station was abolished, when he was sent to Foxfield, which was the Junction of the Furness and Whitehaven and Furness Railways. Three years later he was made a relief clerk for the Clearing House, and removed to Carlisle, but in the Autumn of 1865 he left the Railway Clearing House, and entered the Furness Railway Company's Audit Office, where he has remained until the present time—a service of nearly 48 years. After going through various departments in the Audit Office, he, on the retirement of Mr. Henry Bagot, was appointed Audit Accountant at the end of March, 1904.

Mr. J. Thompson, Storekeeper.

Mr. Thompson entered the service of the Company in July, 1866, shortly after it had taken over the Whitehaven and Furness Line, which extended from Foxfield to Whitehaven, and was appointed Storekeeper in September, 1896, on the retirement, through failing health, of the late Mr. John Latham. He was for some years the Chief Clerk to the late Sir James Ramsden.

Commander Bissett, R.N., Harbour Master.

Barrow is fortunate in having a very capable man as its Harbour Master—a quiet, unassuming, and efficient officer. Born in Barrow, where from 1850 to 1877 his father was accountant to the Furness Railway Company, Commander Charles Bissett served in the Mercantile Marine from 1882 to 1894, and then entered the Royal Naval Reserve as lieutenant. Receiving his commission as a supplementary lieutenant in 1895, he devoted himself to navigation, and during the last war in South Africa served as navigating lieutenant in H.M.S. *Terpsichore*, for which duty he received the medals of the campaign. He retired from the Royal Navy in December, 1910, when he succeeded the late Captain Wards as Harbour Master to the Furness Railway Company. In this capacity he is solely responsible for the launching of warships from the yard of Messrs. Vickers, Limited, as well as for the arrangements made for vessels entering and leaving the port, for the steamship services of the Company, and for all other maritime work in which it may engage at the Barrow Docks.

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MR. J. TELFORD,
Accountant.

MR. W. BROCKELBANK,
Audit Accountant.

MR. J. THOMPSON,
Stores Superintendent.

COMMANDER C. BISSETT, R.N.
Harbour Master, Barrow.

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Furness Abbey and Its Hotel.

At Furness Abbey the visitor finds the rare combination of an excellent hotel standing in the very grounds of one of the finest of the Cistercian monasteries in existence. Occupying a superb position in the thickly-wooded glen of Bekansgesgill, or "The Deadly Nightshade," the abbey was founded in 1127, under the patronage of Stephen, Earl of Moreton and Boulogne, afterwards King of England, by a filiation from the monastery of Savigny, in Normandy The monks were originally Benedictines, but in the time of Richard de Baiocis, they were matriculated into the Cistercian order, to which they belonged at the time of the dissolution, when the buildings and their grounds covering 72 acres were on April 9th, 1537, surrendered to Henry VIII under a deed signed in the chapter house by Roger Pyle, the abbot of that period. Destruction of the fabric immediately took place, and soon little beyond the outer walls remained standing. Private spoliation followed, and the venerable ruins became a common quarry from which people took stone, woodwork, and lead piping as they pleased, without hindrance from any quarter. Having passed through several hands, the property came into the possession of the seventh Duke of Devonshire, by whom it was left to Mr. Victor C. W. Cavendish, and on his succession to the title and estates of the dukedom, it was transferred to his brother, Lord Richard F. Cavendish, the present owner. "In the meantime," says Mr. J. P. Morris, in his admirable guide to the ruins of the abbey, "the vast and magnificent edifice—not merely forsaken and left desolate, but subjected to many a rude spoliation—soon fell to decay and ruin. The portions of it that still remain to tell its melancholy tale, while they transport the spectator with emotions of sublimity and grandeur, solemnly remind him of the mortality of all human things.

> Within this Convent's mould'ring walls,
> The flitting bat a dwelling finds;
> The dreary shower unhinder'd falls,
> And sadly sounds the rushing winds;
> Seeming in every gust to say,
> Thou, too, O man, shalt pass away."

The ruins—which preserve a beautiful sedilia and the earliest military effigies in the Kingdom—are second only in extent to those of Fountains Abbey, in Yorkshire. They embody excellent examples of different architectural periods, and are now most carefully preserved at the joint expense of the owner and of the Furness Railway Company, who have been permitted to build the hotel on the site of one of the guest houses included in the original monastic buildings. A more charming site for an hotel could not be conceived, and the combination is rendered the more effective by the contrast of the adjacent station, designed in singularly happy fashion amid an exceptionally rare setting of lawn and leafage. Visitors walk from the platforms through a covered way to the verandah leading to the lounge, where the ingle nook, seen in one of the accompanying illustrations, forms a cosy corner and contributes greatly to the comfort of visitors. The hotel has for many years been well managed by Messrs. Spiers & Pond, Limited. Mr. and Mrs. F. Bright are the resident managers, and the establishment is under the careful supervision of Mr. H. P. Stephenson, one of Messrs. Spiers & Pond's directors.

A Modern "Guest House."

Standing within the precincts of these magnificent ecclesiastical ruins, and partaking of the picturesque character of its surroundings, Furness Abbey Hotel is unique of its kind. Its external appearance is more like that of an ancient manorial residence than a house of public entertainment, and it may be said to combine the comforts and attractions of both, with others peculiar to itself. The greater part of the existing structure dates from the time of King James I. Most appropriately, this modern "Guest House," like its predecessor, is near the gateway of the monastic domain, the distance from the church and other parts of the ruins being less than 50 yards. That the views from its windows are of great charm and interest need hardly be stated. Gardens immediately surrounding the hotel are carefully laid out, and noted for their luxuriant shrubs and plants, a number of fine holly trees, over 30 ft. in height, affording, with the lower growths, a favourite resort for a great variety of singing birds.

The principal front of the hotel commands a beautiful view of these gardens. Extremely secluded is the position, hidden from the outside world so completely as to be invisible except from the top of a single hill in the neighbourhood and from the railway station. The large coffee room and drawing room overlook the tennis courts and croquet lawn, and the bedrooms

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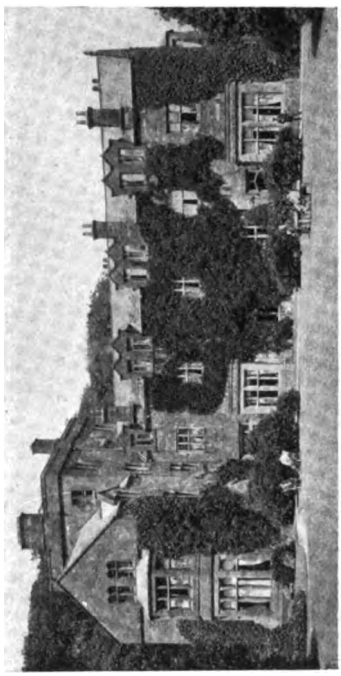
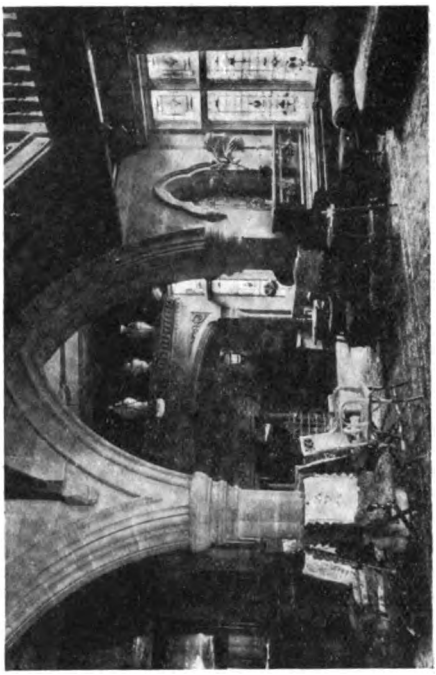
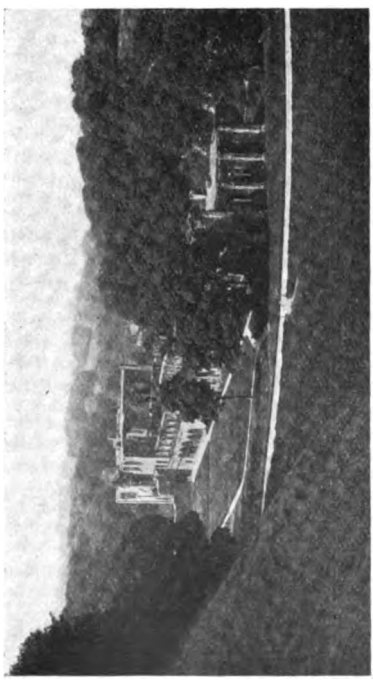


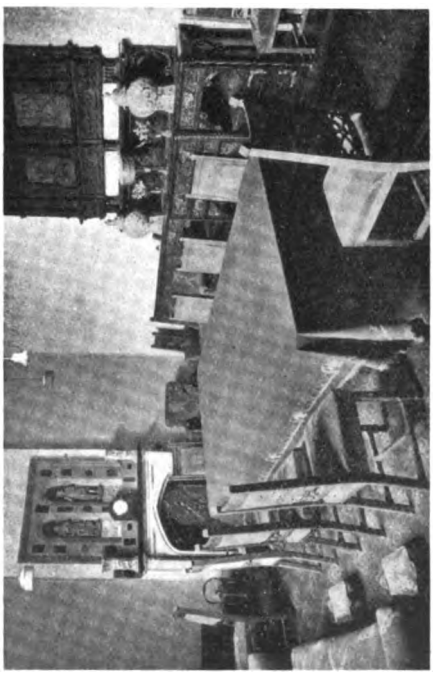
FURNESS ABBEY HOTEL.



FURNESS ABBEY HOTEL: HALL AND INGLE NOOK.



FURNESS ABBEY: GENERAL VIEW.



FURNESS ABBEY HOTEL: THE ABBOT'S ROOM.

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have an equally pleasant vista, the building being literally embowered though not overshadowed among trees. A new sitting-room called the "The Abbot's Room," with ecclesiastical stained-glass window, has been opened on the first floor, the celebrated *bas-reliefs* originally in the Abbey being its principal features. Ingeniously lighted in part by reflection from outside, it is much in demand during the busy periods of the year. A new billiard room is found on the ground floor, and in the ballroom lunch is served to the large parties who visit Furness Abbey from Blackpool, Fleetwood, Windermere, and other tourist-resorts on the Furness Railway. Residents have the use of a good marine golf course at Askam, which is reached by train in 25 minutes. There are also golf links on Walney Island, Barrow. The prosperous town of Barrow is close to Furness Abbey, and the hotel is regularly patronised by naval and military officers of all nations when superintending or inspecting work at Barrow Docks in hand for their respective governments.

Tours in Lakeland.

The Furness Abbey Hotel is also the headquarters of the Automobile Association and Motor Union, and forms an admirable centre for tours in Lakeland, the comparatively short distance between Furness Abbey and the chief places of interest and beauty in the Lake District making the hotel a most convenient point of departure for such excursions. Visitors to the hotel already have the choice daily—from June to the end of September—of the following rail, coach and steam yacht tours through Lakeland :—

No. 1. Outer Circular Tour, embracing Windermere Lake, Furness Abbey, and Coniston.

No. 2. Inner Circular Tour, embracing Furness Abbey, Coniston Lake and Crake Valley.

No. 3. Grange and Windermere Circular Tour, embracing Grange, Arnside, Kendal and Windermere Lake.

No. 4. Middle Circular Tour, embracing Windermere Lake, the Crake Valley, and Coniston Lake.

No. 5. Red Bank and Grasmere Tour, *viâ* Ambleside and Skelwith Force, returning *viâ* Rydal Water.

No. 6. Thirlmere, Grasmere, and Windermere Tour, *viâ* Ambleside, Clappersgate, and Red Bank, and round Thirlmere.

No. 7. Four Lakes Circular Tour, namely :—Coniston, Grasmere, Rydal, and Windermere.

No. 8. Coniston to Coniston Tour, *viâ* Red Bank, Grasmere, and Ambleside, returning by coach to Coniston.

No. 9. Tarn Hows Tour, *viâ* Ambleside and Coniston, returning by Tilberthwaite and Elterwater.

No. 10. Round the Langdales and Dungeon Ghyll Tour, *viâ* Ambleside, Colwith Force, Grasmere, and Rydal.

No. 11. Ullswater Tour, *viâ* Ambleside, Kirkstone Pass, and Brothers Water, returning *viâ* the Vale of Troutbeck and Lowwood.

No. 12. Derwentwater (Keswick) Tour, *viâ* Ambleside, Grasmere, and Thirlmere.

No. 13. Five Lakes Circular Tour, namely :—Windermere, Rydal, Grasmere, Thirlmere, and Derwentwater.

No. 14. Wastwater Tour, *viâ* Seascale and Gosforth (Churchyard Cross, A.D. 680).

No. 15. Six Lakes Circular Tour, namely :—Windermere, Rydal, Grasmere, Thirlmere, Derwentwater, and Ullswater.

No. 16. Duddon Valley Tour, *viâ* Broughton-in-Furness, Ulpha, and Seathwaite.

No. 17. Eskdale Valley Tour, *viâ* Seascale, Holmrook, and Stanley Ghyll, returning *viâ* Santon Bridge and Gosforth.

No. 18. Cartmel Priory and Newby Bridge Tour, *viâ* Grange, Holker Park, Backbarrow Falls and Lake Side.

No. 19. Ennerdale Lake (Daily) and Crummock Water (Thursdays only) Tour.

No. 20. George Romney's Home (1742 to 1755), Walney Bridge and Island, and Furness Abbey Tour, *viâ* Sowerby Woods.

Portrait by George Romney sold at Christie's in June, 1913, for £41,370.

"Tours Through Lakeland" pamphlets giving particulars of these Tours are to be had gratis at all Furness Railway stations and steamers, or from Mr. A. A. Haynes, Superintendent of the Line, Barrow-in-Furness.

Mr. Alfred Aslett, the Secretary and General Manager, has most generously met the needs of tourists, and unrivalled facilities for travel exist, adding greatly to the pleasure of a visit paid to the Furness district. The claims of sport are similarly recognised, and golfers, anglers and others may obtain cheap special day tickets. Pleasure resorts on the line are accessible all the year round, at fares approaching the amount of single fares for the double journey; weekly tickets are issued at about half the ordinary fare, available for six return journeys;

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WASTWATER: GENERAL VIEW FROM ROAD.

CONISTON, FROM ABOVE THE RAILWAY STATION.

GRASMERE FROM HUNTING STILE.

G. P. Abraham]

BOWNESS, WINDERMERE. [*Keswick.*

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and special tourists' weekly tickets, including cycle, allowing an unlimited number of journeys between certain groups of stations, are issued at remarkably cheap rates. These tickets may be obtained from May 1st to September 30th. One example, namely, "Group 4," is sufficient to show the remarkable facilities secured by the holders. The stations therein included are:

GROUP 4.

Silverdale	Barrow
Arnside	Askam
Sandside	Kirkby
Heversham	Foxfield
Grange	Broughton
Kents Bank	Woodland
Cark	Torver
Ulverston	Coniston
Greenodd	Millom
Haverthwaite	Silecroft
Lake Side	Bootle
Bowness	Ravenglass
Ambleside	Drigg
Dalton	Seascale
Furness Abbey	St. Bees

Whitehaven.

ORDINARY RETURN FARE—	1st Class.	3rd Class.
Silverdale and Whitehaven ..	18/7	10/7
Ulverston and Lake Side ..	2/10	1/7
Foxfield and Coniston	2/11	1/8
Ambleside and Lake Side (steam yacht)	3/-	2/6
Coniston (new steam yacht *Lady of the Lake*, or *Gondola*) ..	1/6	1/-
Total	28/10	17/4
Tourists' weekly ticket fare ..	20/-	13/6

Passenger and goods services are maintained throughout the year on Lake Windermere. From May 10th until the end of the summer season steamers conveying passengers run as follow:—

For the convenience of tourists staying in the neighbourhood of Windermere, cheap weekly tickets will be issued on application at the Lake Stations and at the company's booking office, Grasmere. At Lake Side, where passengers leave the trains to join the steamers, the Furness Railway Company have provided a large refreshment pavilion at the very edge of the water. Its balcony, with glass canopy, commands splendid views of the lake, and contains seating accommodation for 350 persons, while below, on the road level, is a handsome buffet, in which all kinds of light refreshments may be obtained. Messrs. Spiers and Pond are the contractors. An orchestra is heard in the pavilion during the summer months, for luncheon and tea, and in the circumstances Lake Side has assumed a holiday aspect that makes it extremely attractive. There are hotels close to all the piers at which the steamers call, as also at Newby Bridge, the exceedingly picturesque resort at the foot of Windermere. At Coniston, the Furness Railway Company have also established a large tea pavilion on the platform of the station, commanding lovely views of the Yewdale Valley.

On Lake Coniston the *Lady of the Lake* and the *Gondola*—one of the handsomest and most popular steam yachts in the country—run during the summer months. The *Gondola*, a screw steamer, was originally built so that its funnel should not be seen, the exhaust steam being passed out at the stern. But this arrangement was not satisfactory, and a funnel is now fitted.

DOWN THE LAKE.

	Week Days.									Sundays.			
	a.m.	a.m.	a.m.	p.m.	p.m.	p.m.	p.m.	p.m.	p.m.	noon	p.m.	p.m.	p.m.
Ambleside .. dep.	8 30	9 50	11 5	12 30	2 45	4 20	5 10	6 20	7 15	12 0	2 0	4 30	6 15
Lowwood* .. ,,	8 35	9 55	11 10	12 35	2 50	4 25	5 15	6 25	7 20	12 5	2 5	4 35	6 20
Bowness .. arr.	8 55	10 15	11 30	12 55	3 10	4 45	5 35	6 45	7 40	12 25	2 25	4 55	6 40
Bowness .. dep.	9 0	10 20	11 35	1 0	3 15	4 50	5 40	6 50	7 45	12 30	2 30	5 0	6 45
Ferry .. .. ,,	9 5	10 25	11 40	1 5	3 20	4 55	5 45	6 55	7 50	12 35	2 35	5 5	6 50
Storrs* .. .. ,,	9 10	10 30	11 45	1 10	3 25	5 0	5 50	7 0	7 55	12 40	2 40	5 10	6 55
Lake Side .. arr.	9 40	11 0	12 15	1 40	3 55	5 30	6 20	7 30	8 25	1 10	3 10	5 40	7 25

UP THE LAKE.

	Week Days.									Sundays.			
	a.m.	a.m.	a.m.	p.m.	p.m.	p.m.	p.m.	p.m.	p.m.	a.m.	p.m.	p.m.	p.m.
Lake Side .. dep.	8 35	9 50	11 15	..	1 25	2 0	2 55	5 30	7 5	11 40	2 15	3 20	5 55
Storrs* .. .. ,,	9 0	10 15	11 40	..	1 50	..	3 20	5 55	7 30	12 5	2 40	3 45	6 20
Ferry .. .. ,,	9 5	10 20	11 45	..	1 55	..	3 25	6 0	7 35	12 10	2 45	3 50	6 25
Bowness .. arr.	9 10	10 25	11 50	..	2 0	2 30	3 30	6 5	7 40	12 15	2 50	3 55	6 30
Bowness .. dep.	9 15	10 30	11 55	1 15	2 5	2 35	3 35	6 10	7 45	12 20	2 55	4 0	6 35
Lowwood* .. ,,	9 35	10 50	12 15	1 35	2 25	..	3 55	6 30	8 5	12 40	3 15	4 20	6 55
Ambleside .. arr.	9 45	11 0	12 25	1 45	2 35	3 0	4 5	6 40	8 15	12 50	3 25	4 30	7 5

* Calls when required only.

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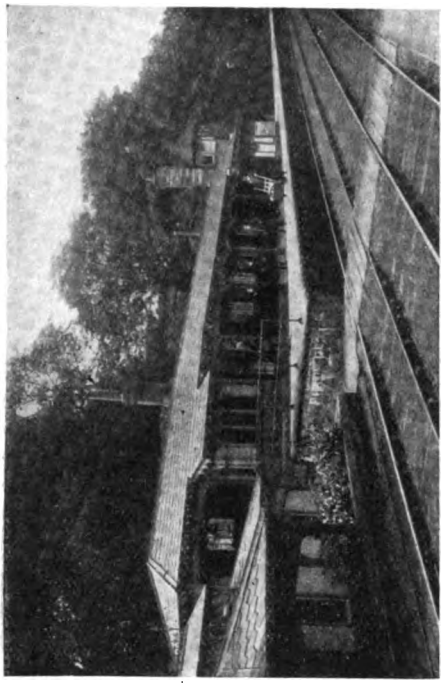
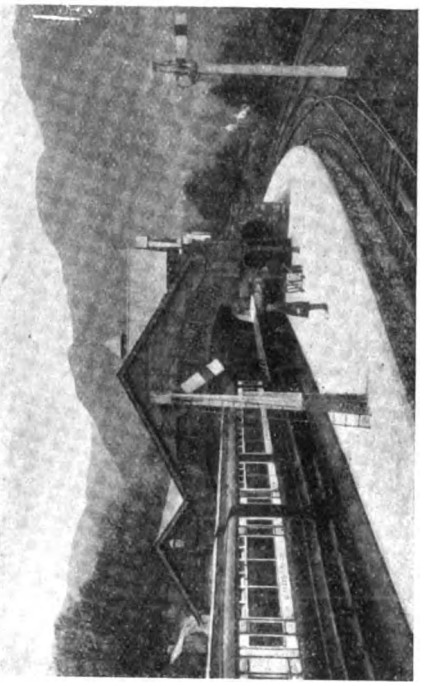
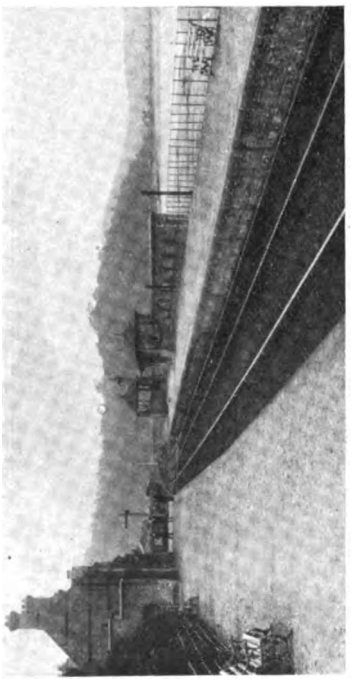


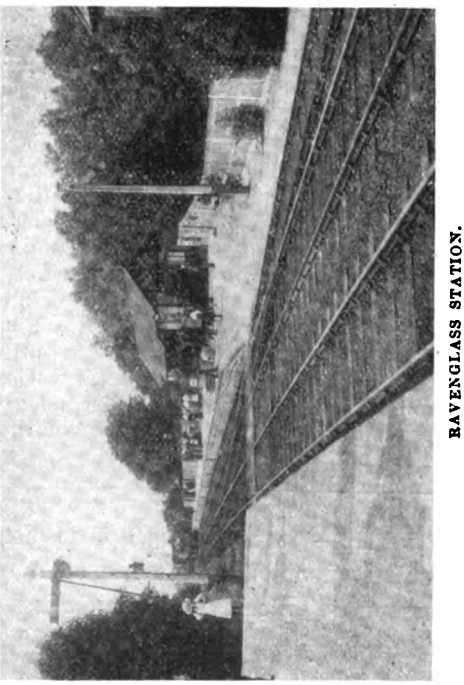
FURNESS ABBEY STATION.



CONISTON STATION AND YEWDALE FELLS.



GREENODD STATION.



RAVENGLASS STATION.

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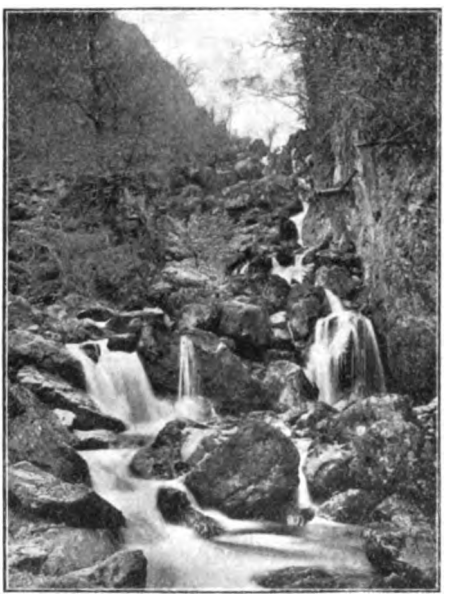
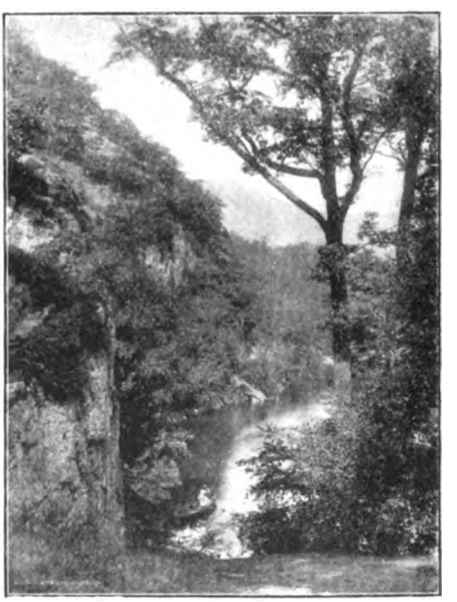


G. P. Abraham] [*Keswick.*
LODORE FALLS, DERWENTWATER.

The *Lady of the Lake*, built by Messrs. Thornycroft & Co., in 1908, carries over 370 passengers, and is a very popular vessel.

In addition to the numerous tours mentioned, the Furness Railway Company conduct an extensive holiday traffic between Barrow and Fleetwood by their steamers, whence trains and tramcars run to Blackpool, the busiest of all British marine resorts. Two tours are arranged—an outer one taking people by sea, rail, lake and coach to Furness Abbey, Windermere, and Coniston, and an inner one embracing Furness Abbey, the Crake Valley, and Coniston Lake. Visitors leave Blackpoo about 10.0 a.m., and arrive at Fleetwood in time to take the popular paddle steamers *Lady Evelyn* or *Lady Moyra* to Barrow. A refreshing sail across Morecambe Bay occupies about an hour, and Ramsden Dock is then reached. A special fast train is in waiting, and passengers on the circular tour are soon on their way to Lake Side, where lunch is served in the Lake Side Pavilion restaurant. Visitors then embark on one of the company's steam yachts, and are tal·en to Ambleside.

Chars-à-banc are in readiness, and the drive through the delightful scenery to Coniston begins. After a brief stay at Coniston, sufficient for seeing most of the places of interest, train is taken to Ramsden Dock, and the steamer leaves Barrow at 7.0 p.m., arriving in Fleetwood at 8 o'clock. The tour is an unequalled combination of travel ; the distance covered is about 100 miles, and the Furness Company may well boast that the trip is unique. A band accompanies each vessel across Morecambe Bay—a distance of about 18 miles—and the journey is completed in a little less than an hour. On fine Sunday evenings the steamers frequently convey from 1,200 to 1,800 passengers, and the excursion is one of the best on the Lancashire coast.



G. P. Abraham] [*Keswick.*
STYBARROW CRAG, ULLSWATER.

NOTE.—We are compelled to hold over until next month an account of the great Barrow Shipbuilding works of Messrs. Vickers, Limited, and of the home of George Romney, the celebrated painter, whose portrait of Anne Lady de la Pole has recently realised the enormous sum of £41,370, the highest price ever paid for a painting in the auction rooms.

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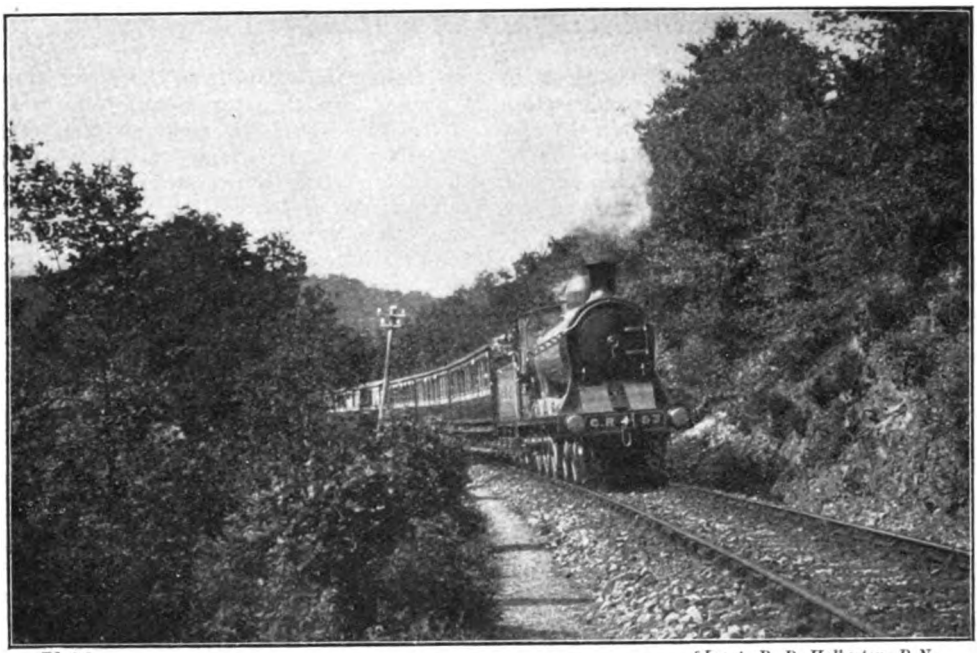

Photo] [*Lieut. B. D. Holberton, R.N.*

CALEDONIAN RAILWAY:

Oban-Glasgow Express near Taynuilt. 4–6–0 locomotive, No. 53.

British Locomotive Practice and Performance.

By CECIL J. ALLEN.

A CORRESPONDENT has asked me for some information concerning the various superheaters at present in use on locomotives in this country, and for a simple description of the leading features in which each type differs from the others. "I should particularly like information," he adds, "as to the apparatus recently introduced on the London and South Western Railway, and variously described as a 'steam-drier,' and a 'superheater giving a low degree of superheat,' as I had imagined from reading an article in an earlier issue of the RAILWAY MAGAZINE that an apparatus giving only a low degree of superheat added next to nothing to the engine's efficiency, and only produced the negative advantage of not necessitating special arrangements for lubricating." I will endeavour to answer briefly my correspondent's inquiry.

The superheaters employed chiefly in this country are five in number: (1) the Schmidt, (2) the Robinson, (3) the Swindon, (4) the Phœnix, and (5) the Drummond patterns; the two first-named affording a high range of superheat, and the third and fourth a more moderate range, while the last-mentioned is little more than a "steam-drier." In this connection the following salient points associated with superheating should be noted. First, the temperature of the saturated steam is directly dependent on the working pressure at which it is generated, the temperature rising with the pressure. A useful approximation to obtain this figure is to halve the pressure and add a constant of 290, which gives the temperature in degrees Fahrenheit within but a very small margin of error. Thus the temperature of the steam generated by an engine working at 150 lbs. per sq. in., as, for example, a Great Northern superheater "Atlantic," is

$$\frac{150}{2} + 290 = 365°\text{F.},$$

while that of a standard Great Western locomotive, whose boiler is pressed to 225 lbs., works out at

$$\frac{225}{2} + 290 = 403°\text{F.}$$

In the second place, the main object of

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superheating is to obviate the loss of efficiency consequent upon the condensation of steam in the cylinders, which, in the case of saturated steam, may amount to as much as 40 per cent. Low superheat, as may be realised by a steam-drier, has certain advantages, while constructionally it is more easily obtained, as the steam need only be passed through coils in the smoke-box on its way from the boiler to the cylinders, or caused to traverse a steam-drum or chamber through which fire tubes, or extensions thereof, are fitted. First cost is not necessarily a serious item, and the expense of maintenance should be almost negligible, while the whole apparatus, if suitably designed and of simple form, is readily available for repairs. Finally, no special form of forced lubrication is required. On the other hand, however, the benefits obtained from this form of superheater, if it might so be called, are so small that to instal it is a matter of doubtful economy. A more elaborate type of superheater on these lines, requiring a large smoke-box is the "Phœnix," which has been fitted to several engines on the Great Northern Railway of Ireland, the Furness and to one or two locomotives belonging to the London and North Western, Hull and Barnsley, and North British Railways. It has not had conspicuous success, although it is still being tried in isolated cases. In some instances the apparatus has been taken out.

Finally, the act of superheating the steam causes it to increase in volume. On this account engines employing highly superheated steam for their propulsion are usually furnished with cylinders of an increased diameter, while the ability of the steam to expand in a greater ratio than superheated steam enables the cut-off to be effected at an earlier point when the engine is running at speed. Highly superheated steam, therefore, renders possible an increase in tractive effort, or a reduction in boiler pressure and maintenance, if no increase in tractive effort be needed, together with economies in fuel and water consumption, the exact ratio of the increase and decrease depending on the design of the locomotive and the work upon which it is engaged. Against these savings must be set the provision of special lubrication, and the increased working expenses attendant thereon, together with the maintenance of superheater, steam passages, etc., in a perfectly steam-tight condition—no easy matter when what is practically a gas is being dealt with. High superheat is obtained by passing the steam from the boiler into a "header" in the smoke-box, from which it travels from the smoke-box towards the fire-box and back again through nests of tubes fitted into large fire-tubes, the temperature of the steam rising the whole time this process continues. The final temperature of the steam depends first on the working pressure, and next on the amount of exposure to the heat of the fire it has received in the superheater tubes.

Each la ge fire-tube, with its nest of steam tubes, is known as an "element." In the Swindon superheater each element contains three steam tubes of very small diameter, doubled back at the fire-box end in order to return to the header. In the Schmidt and Robinson types, there are in each large fire-tube two double steam tubes of larger diameter, forming a four-fold length reversing twice near the fire-box and once near the header to which the end lengths are, of course, connected. Roughly, however, it may be taken that the actual degree of superheat is governed by the heating surface, length of steam path, and steam velocity. In the Schmidt apparatus there are usually 18, 21, or 24 elements; in the Robinson, 18; and in the Swindon pattern, with its more moderate superheat, 14. In other respects the three types are generally very similar, the principal differences lying in purely mechanical details, such as the substitution of cast iron in the two English patterns for the cast steel of the header in the Schmidt superheater, and of different methods of fixing the superheater elements to it. It is claimed for the Robinson design that the method adopted results in a more "sound running-shed job." On the other hand, it is argued by advocates of the Schmidt system, which is employed for the majority of high-degree superheater engines used in the United Kingdom, that the ready detachability of each element from the header and other constructional features render it more satisfactory as an ordinary everyday working appliance.

In the Robinson design, also, the damper which, working automatically with the regulator by means of the familiar steam cylinder and lever on the side of the smoke-box, closes the fire-tubes when the engine is "coasting," and so prevents the steam tubes from burning out when they are empty of steam, is replaced by a series of small steam jets, which come into operation when steam is shut off, and form a "plug" of steam in each large fire-tube to prevent the fire-gases

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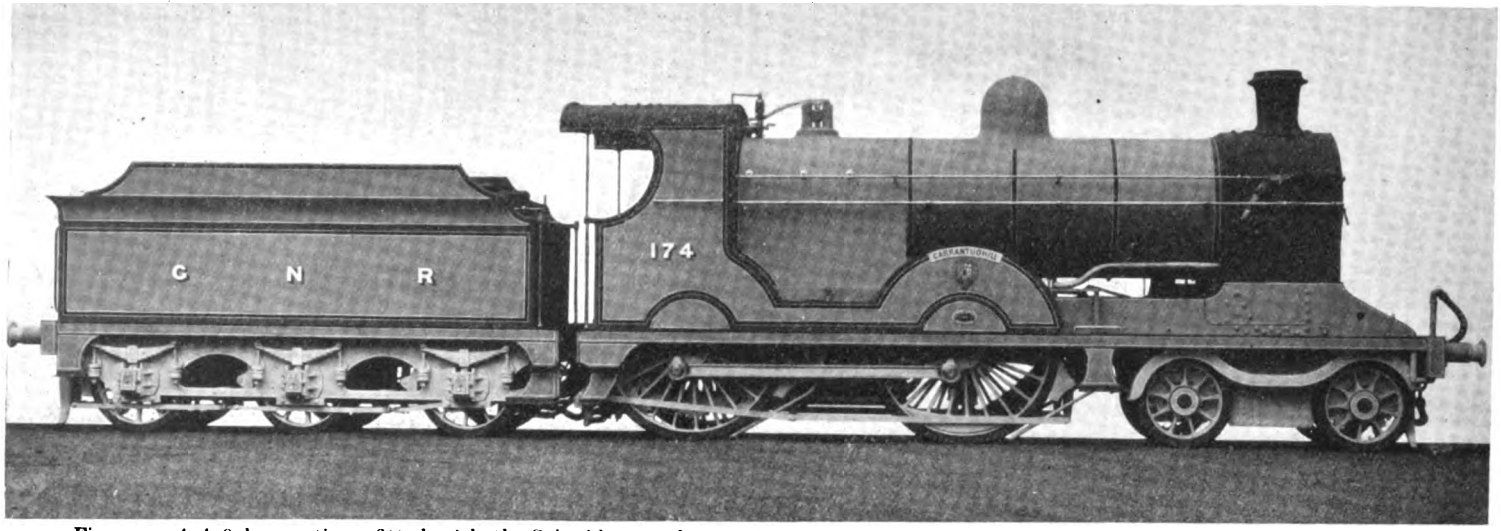
NEW 4-4-0 SUPERHEATER LOCOMOTIVES: GREAT NORTHERN RAILWAY OF IRELAND.



Five new 4–4–0 locomotives, fitted with the Schmidt superheater, have recently been placed in service on the Great Northern Railway of Ireland for working the heaviest line traffic. One of these is now illustrated, by the courtesy of Mr. G. T. Glover, Locomotive Superintendent. As far as possible details have been kept standard with existing practice. Wakefield's mechanical feed lubricators are used on three engines, the other two having Stone's mechanical feed lubricators. A Davies & Metcalfe exhaust injector is fitted on the right-hand side and Gresham's & Cravens' ordinary injectors on the left-hand. The engines are built up to the maximum weight allowed on any one pair of wheels: 17 tons per pair. The main features of this design were already laid down by Mr. Charles Clifford, the late Locomotive Superintendent, Mr. G. T. Glover being only responsible for sundry detail alterations.

The following are the principal dimensions:—

Gauge	5 ft. 3 in.
Cylinders	19 in. by 26 in.
Heating Surface—	
Tubes	975 sq. ft.
Firebox	141 sq. ft.
Superheater	250 sq. ft.
Total	1,366 sq. ft.
Grate area	22·9 sq. ft.
Working pressure	165 lbs. per sq. in.
Diameter of wheels—	
Coupled	6 ft. 7 in.
Bogie	3 ft. 2 in.
Total wheel base	23 ft. 0½ in.
Weight in working order	52 tons 2 cwt.
Tender: Water capacity	2,500 galls.
Coal	4 tons.
Weight in working order	30 tons 11 cwt.

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from over-heating the steam tubes. Mr. H. Fowler, Chief Mechanical Engineer of the Midland Railway, who uses the Schmidt superheater, has also introduced some patented improvements. These include a cylinder bye-pass valve, for use when the engine is coasting, which, according to indicator diagrams, taken at 60 miles per hour, has reduced the maximum compression in front of the piston from 40·5 to 11·5 lbs., and also, as with the Robinson superheater, the use of a cast-iron header with modified methods of fixing the superheater elements. There is also an improved form of damper control, which allows the fire-tube dampers to be worked at will independently of the movements of the regulator. This is to prevent the superheater elements cooling down when the engine is not working under continuous steam, as when frequent stops are being made, since it has been found by experience that a locomotive requires from 5 to 8 minutes to "get its superheat"—that is, to get the steam passages heated to the correct superheat temperature. This very brief and, I fear, somewhat inadequate description will, perhaps, suffice to meet my correspondent's needs.

Before receiving the letter mentioned, it had been my intention in the present issue to deal with the runs of existing types of engine which have recently been fitted with superheaters, as certain of these locomotives seem to have vied with each other lately in breaking all my records. Beginning with the Great Northern Railway, on which, up to the present, only one of the large standard "Atlantics," No. 1434, has been fitted with a superheater (other than the 10 engines, Nos. 1452–1461, so built, and the two smaller "Atlantics," Nos. 271 and 988, which have also been converted to superheaters), I will give a representative run on the 1.30 p.m. *ex*-King's Cross—this and the 5.45 p.m. down being the favourite expresses for experimental working. The train was made up of 8 vehicles, comprising 38 axles, and weighing empty 251 tons 1 cwt. "With passengers and luggage, staff and stores," to quote a characteristic phrase of the late Charles Rous-Marten, the total load behind the tender might be taken as 275 tons.

At the outset of the run every Great Northern "Atlantic" record I have in my possession was broken. Finsbury Park, 2½ miles out (mostly at 1 in 105 to 110), was passed in 6 min. A speed of 60 miles per hour was obtained on the slight descent to near Wood Green, and a *minimum* speed of 50·6 miles per hour actually maintained to the summit of 8¼ continuous miles at 1 in 200 which culminate at Potters Bar. Thus Potters Bar, 12¾ miles from the start, was passed in 17¾ min., and Hatfield, 17¾ miles, in 22 min. 35 secs., at a speed of 73·8 miles per hour. This time I have only beaten previously on three occasions in the whole of my Great Northern experience, and each of these was with the short-lived 2.15 p.m. down Leeds and Bradford express, and a load of only 18 axles, or 130 tons behind the tender. No. 263, one of Mr. Ivatt's large 4–2–2 engines, took me through Hatfield on two occasions in 21 min. 55 sec., and 21 min. 40 sec. respectively against a booking of 22 min., while No. 49, an Ivatt 4–4–0, covered this initial distance in 20 min. 38 sec. on the inaugural trip—a remarkable feat—passing Finsbury Park in 4 min. 48 sec., attaining 63·4 miles per hour at Wood Green, and reaching Potters Bar summit in 15 min. 53 sec., at a minimum speed of 55·6 miles per hour. But this was in all respects an exceptional train. Out of the 64 runs that I have timed on the 10 a.m., 10.10 a.m., 1.30 p.m., 1.40 p.m., 5.30 p.m., and 6.5 p.m. expresses *ex*-King's Cross—all booked through Hatfield in 23 min.—an improvement on schedule time with "Atlantics" was only recorded on two occasions—once on the 5.30 p.m. with 265 tons, when 22 min. 55 sec. was taken, and once on the 1.30 p.m. with 285 tons, when No. 1439 covered the distance in 22 min. 50 sec. The average time on the 10 a.m. down, in 18 runs, was 26 min. 53 sec., so that the work of No. 1434, in passing Hatfield in 22 min. 35 sec. with a very fair load, was of quite exceptional merit.

At "20-Mile Down" box, shortly after Hatfield, we were checked for relaying, and so took 38 min. to pass Hitchin—32 miles. A maximum speed of 80·3 miles per hour was attained on the falling grades before Arlesey; but, as we were now getting well in front of time, there was a decided easing up, and the short rise to St. Neot's reduced speed to 57·7 miles per hour. Huntingdon, 58¾ miles, was passed in 62¼ min., at 67 miles per hour, and speed then fell to 44·1 miles per hour on the 1 in 200 of Stukeley bank. No exceptional speed was attempted on Abbot's Ripton bank, a maximum of only 72·5 miles per hour being touched, and with easy running beyond, we drew up at Peterborough, 76¼ miles from London, in 80 min. 55 sec. from the start, 79 min. net, against a schedule of 83 min. With such an excellent start, a 77 or 76 min. timing from London to

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Peterborough could have been achieved with ease, provided we had had no checks, and had run harder from Sandy onwards.

The start from Peterborough was another brilliant effort, substantially beating all my previous times to Stoke on the 10.10 a.m., 1.30 p.m., and 1.40 p.m. trains, and even all my times from *passing* Peterborough to Stoke on the 10 a.m. and 2.20 p.m. down Scotch expresses save two only. One of the latter was with No. 1442 and 325 tons, when the 23¾ miles occupied 28¾ min., and the other with 1432 and 275 tons, when 28¼ min. were taken for the same distance. On the present trip we were running at 62·5 miles per hour at Werrington, and increased this to a sustained 65·2 up the gradual rise to Essendine, which finishes at 1 in 440 and 1 in 264. Essendine, 12¼ miles from Peterborough, was passed in exactly 15 min. from the start. Even after ½-mile up at 1 in 240 and 1½ miles at 1 in 200, we were still doing 57 miles per hour at Little Bytham; but thenceforward the work fell off somewhat, presumably as we were again getting before time, and at Stoke summit we had fallen to a minimum of 39·5 miles per hour. This point, 24¼ miles from Peterborough, was passed in 28¾ min. At Great Ponton relaying was again in progress, for which we slacked cautiously, but still passed Grantham, 29¼ miles, in 35 min. 50 sec.—about 34 or 34¼ min. net—and then had a comparatively easy task to keep time for the remainder of the distance. The 14¾ miles from Grantham to Newark took 13¾ min., with a maximum speed of 71·4 miles per hour at Claypole, the 18½ miles from Newark over Askham summit to Retford 18 min. 40 sec.; and the last 17½ miles from Retford to Doncaster, under easy steam, 18 min. 20 sec. This gave a total time of 86 min. 35 sec. for the 79¾ miles from Peterborough—again an economy of nearly 1½ min. on schedule—and a net time not exceeding 85 min. It should be added that during this exceptionally fine run a brisk west wind was blowing, which tended to hamper the locomotive.

Proceeding to York the same day, I was treated to the third of a series of three "flying" runs which, while not bearing on this month's subject, will form a suitable introduction to the treatise on "Speed" which is to follow. The train was one to which I have referred previously in these columns—the 5.45 p.m. express from York to Thirsk, conveying the through coach off the 1.40 p.m. express *ex*-King's Cross for West Hartlepool. "Limited Express" is a title which might with some justice be applied to this "flier," seeing that the normal load is one of only two vehicles at most, and more frequently one, while an additional source of interest lies in the fact that the motive power is furnished by the Great Northern Railway, to balance certain engine workings in the Doncaster-Harrogate direction. On each of these three runs we had a load of two eight-wheelers, or 65 tons in all, the engine on the first run being No. 47, and on the second and third No. 1376, both belonging to Mr. Ivatt's 4–4–0 class W. The first occasion furnished a record time of 7 min. for the 5⅝ miles out to Beningbrough, which I have never beaten before or since, although we started very cautiously from the south end of York station. At the end of three miles we were doing 60 miles per hour, at Beningbrough 69·2, and before Tollerton 71·4, passing Alne, 11¼ miles, in 12 min. 5 sec., and Raskelf, 13½ miles, in 14 min. Unfortunately, we were stopped by signal at the north fork junction, just before Pilmoor, and, coming to rest very slowly, completed this 15¼ miles start-to-stop in 16 min. 50 sec. Resuming, we ran the 7¼ miles to a stop in the station yard beyond Thirsk in the smart time of 9 min. 25 sec.

The next two runs were still faster. No. 1376 on the second occasion had touched 62·5 miles per hour at Skelton Bridge, just over 3 miles from the start, was running at 69·2 miles per hour through Beningbrough, and maintained an even 71·4 to 72·5 miles per hour for many miles beyond, touching 73·8 after Pilmoor. Beningbrough was passed in 7 min. 10 sec.; Alne in 12 min. 20 sec.; Pilmoor, 16¼ miles, in 16 min. 20 sec.; and Sessay, 18⅛ miles, in 17 min. 55 sec. Approaching Thirsk, well before time, we were slacked for signals, and then stopped dead at the 22nd mile-post, having covered this distance start-to-stop in 23 min. 35 sec., or not more than 22½ min. net. On the last trip, with the same engine, much the same performance was repeated, except for a slightly slower speed to Pilmoor, and a higher speed beyond, touching a maximum of 75 miles per hour near Sessay. The time to Beningbrough was again 7 min. 10 sec., to Alne also 12 min. 20 sec., to Pilmoor 16 min. 25 sec., and to Sessay, 18⅛ miles, 18 min. 5 sec. We passed the 20¾ mile-post in 20 min. 25 sec. from York, and stopped for signals opposite the 21¾ mile-post in 23 min. 5 sec. from York.

From the nature of these runs it will be inferred, and correctly, that I am about to

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pass on to some runs with the famous North Eastern Railway "Limited," which secures for that company the distinction of having the "fastest booked run in the British Empire," although, be it said, without a locomotive effort altogether commensurate with the title. I am giving these runs chiefly with the object of showing off the behaviour of the 4–4–0 R class engine No. 1207, which, with Nos. 2013 and 2109 of the same type, in addition to a number of engines of the large R1 and the small-wheeled "Waterbury" engines—both 4–4–0 types—have recently been fitted with superheaters of the Robinson pattern. In order that I may not have to go into much detail, I have tabulated the seven runs, together with the salient features of each in the matter of maximum and minimum speeds :—

To recapitulate briefly the gradients, if such they might be called, the run starts with a level 3 miles to Croft Spa, followed by 2 up at 1 in 356 and 377 to Eryholme Junction. After this there are 4 miles down at 1 in 696, succeeded by 4 miles very slightly adverse to near Northallerton, in the middle of which lie Wiske Moor troughs—a slight hindrance to the speed of light trains if water be taken. From this point a fall at 7 miles at 1 in 628 and 624 to Thirsk constitutes the only further gradient worth mentioning, as the remainder of the distance is virtually level, only in the faintest degree favouring the engine. Five miles at 1 in 805, from Sessay to near Alne, are generally productive of high speed, modest though the grade may seem.

No detailed description of the runs is furnished, as all the necessary particulars

NORTH EASTERN RAILWAY: 1.9 P.M. EXPRESS—DARLINGTON TO YORK.

Distance (miles)	Run No. / Engine No. / Type 4–4–0, Class / Load (axles) / Load (tons)	Bk'dtimes(mins.)	1 1626 M1 23 145		2 2012 R 20 135		3 1209 R 27 175		4 1209 R 28 190		5 1209 R 20 135		6 1207 R (S'h't'r) 20 135		7 1672 R 24 165	
—	Darlington	—	0.00	*	0.00	*	0.00	*	0.00	*	0.00	*	0.00	*	0.00	*
5¼	Eryholme Junction	—	7.35	55½	7.15		7.20		7.10	60	7.10		7.10	60	6.14	69¼
10⅜	Danby Wiske ..	—	12.30	68	12.05	70¼	12.15	69¼	11.55	69¼	11.45	71½	11.35	76¼	10.33	
14⅛	Northallerton ..	14	15.55	67	15.30	67	15.45	64¼	15.20		15.10	67	14.45	71½	13.46	
17⅜	Otterington	—	19.00		18.35		18.50		18.25		18.05		17.40		16.36	
21⅞	Thirsk	21½	22.40	72½	22.15	72½	22.30	73¾	22.15	70½	21.30	77½	21.05	77½	20.04	78¼
28	Pilmoor	—	28.05		27.35	70¼	27.45		28.00		26.40		26.10	73¾	25.09	
					a											
33	Alne..	32	32.20	73¾	32.10		31.50	76¼	32.35		30.40	75	30.05	77½	29.09	76¼
38⅝	Beningbrough ..	—	37.15		38.40		36.35		38.05		35.35	70½	34.30	80¼	33.45	
													b			
42⅝	Poppleton Junction	40	40.45		—		39.55		42.00		39.00		40.00		37.00	
44¼	York	43	43.15		44.55		42.20		44.35		41.35		42.50		39.34	
44¼	net time (min.) ..	43	43¼		42¾		42¼		44½		41½		40		39½	
33⅜	Eryholme to Beningbrough		29.40	† 67.5	a 31.25	† 63.9	29.15	† 68.3	30.55	† 64.8	28.25	† 70.5	27.20	† 73.2	27.31	† 72.8
21	Otterington to Beningbrough		18.15	69.1	a 20.05	62.8	17.45	71.0	19.40	64.0	17.30	72.0	16.50	75.0	17.09	73.8

* Maximum and minimum speeds.
† Average speeds throughout.
a Permanent way check, Alne.
b Severe permanent way check, Skelton Bridge.

The first, as will be seen, was made behind an old 4–4–0 of the M1 type, Nos. 2–5 inclusive, behind standard R class engines, No. 6 with No. 1207, while No. 7 is the record run timed by a Gateshead friend, which appeared in these columns some years ago, and is now inserted for comparative purposes.

may be gleaned from the table, but one or two explanatory remarks are necessary. The small engine whose run appears in column 1 was substituted at Darlington at short notice for the R class locomotive drawing the train, in consequence of the failure of the latter, and did astonishingly well. It

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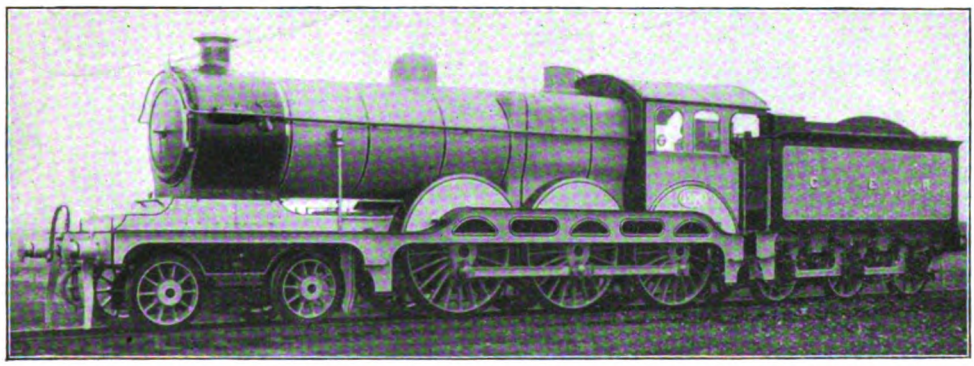
is only in the slower start that any appreciable difference between this and the average of the other runs may be noticed, the average speed of 69·1 miles per hour from Otterington to Beningbrough being a fine achievement for an engine of this type. Time would have been kept easily on the second trip but for the Alne check. This run in other respects, together with run 3, represents about the average times for this train. Run 4, with an exceptional load, started excellently; but for some obscure reason, the speed fell off sadly after Thirsk, this being the only occasion on which a loss of time could be booked against the engine —95 sec., to be exact. A very fine run, under ordinary conditions, is that shown in column 5, a maximum speed of 77·5 miles per hour being attained at Thirsk, after the on which "even time" was obtained, and improved on, before reaching Otterington. Again the speed was very high at Thirsk, while the same maximum was reached at Alne. But this was completely eclipsed shortly afterwards, as on the *dead level*, for nearly 3 miles before Beningbrough and a further one beyond, a continuous speed of 80·3 miles per hour was *maintained unbroken*, this being a feat that I have never achieved or even approached before on any line. The astonishing feature of the whole run was that a boisterous south-westerly wind was hampering our progress the whole way, being especially in evidence at the time of this unexpected "sprint," while also the maximum speed was reached on the level, and not the conclusion of the slightly inclined lengths, as in the case of all the other maxima. Thus



NEW 4–6–0 LOCOMOTIVE (SCHMIDT SUPERHEATER): GREAT EASTERN RAILWAY.

Ten further engines of the 4–6–0 superheater class introduced at the end of 1911 by Mr. S. D. Holden have now been placed in service by Mr. A. J. Hill. As will be seen from the above illustration, the splashers of the trailing wheels are now outlined over the side sheets of the cab. Except for one or two minor features, the design is unaltered from that of the original five engines.

7 miles at 1 in 628 and 624, an average of over 70 miles per hour being maintained from Eryholme through to Beningbrough.

My *pièce de résistance* is, however, run No. 6. The start was, as can be seen, quite moderate—whether this was due to the slipping we experienced at the start or the driver's knowledge that we were "on time," or to the characteristic sluggishness of superheater engines while "getting their superheat," I am unable to determine. But once past Eryholme, the engine was "given her head," and the speed never again fell below 70 miles per hour till we slacked at Skelton Bridge. The maximum of 76·3 miles per hour at Danby Wiske was unusual, as also the high minimum of 71½ at Northallerton, while this was the first of my runs the engine evidently had power in reserve on the earlier stages of the run. To keep time in spite of an exceptionally severe permanent way slack, as was experienced for a full half-mile in the neighbourhood of Skelton Bridge, was indeed a noteworthy feat, and, allowing for a continuance of our tremendous speed until we slacked for York, the net time shown of 40 min. for the 44¼ miles would have been achieved with ease.

The last run, shown in column 7, was, of course, an extraordinary effort with a heavier load; but in this case the weather was calm, and the start behind time, thus affording a stimulus to fast running. It was in starting that the most phenomenal work was achieved, as the engine was doing 67·1 miles per hour at Croft Spa, and actually

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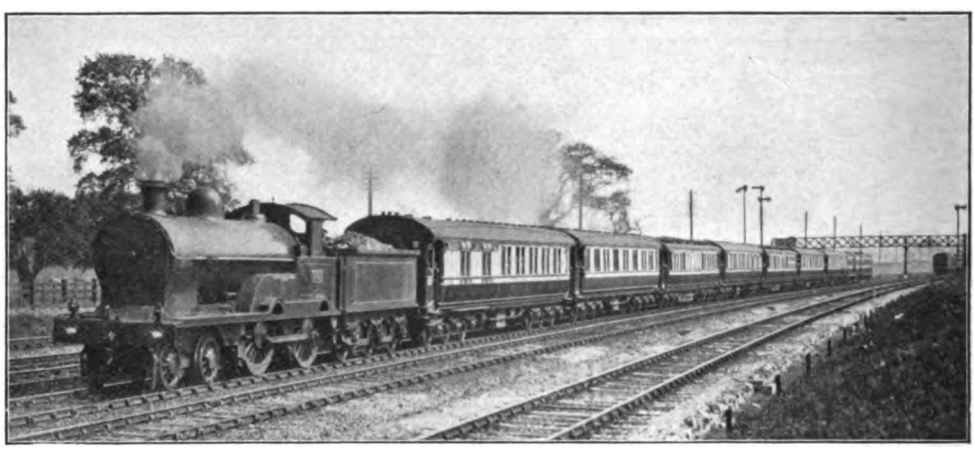
accelerated to 69·2 up the 1 in 356 and 377 to Eryholme, whereas, on most of the other runs tabulated, including No. 6, a speed of about a mile-a-minute was maintained between these two points. A good deal has been heard in the past about the famous American "Atlantic City" fliers, which daily run over the 55½ miles from Camden (Philadelphia) to Atlantic City in 50 min. It is well, however, to remember that the express now under review is horsed by a locomotive of little more than half the tractive power of the 4–4–2 engines employed on the Atlantic City trains. Yet, had the 1.9 p.m. *ex*-Darlington, a 10¾ miles' further run, continuing on the level at the same speed, and a less slow approach to the terminal point as is afforded by the tortuous 1⅝ miles from Poppleton Junction right through to the south end of York station, No. 1209 in run 5 would easily have completed 55 miles in 50½ or 51 min.; while the time occupied by Nos. 1207 and 1672 in runs 6 and 7 would have been more like 48 min. for a journey extended on the level to 55½ miles. So we have runs in this country equal to the best efforts of the United States.

Before leaving the North Eastern Railway, I may as well mention a run with the now well-known "Stumpf" type 4–6–0 engine, No. 825, which was, however, rather a dismal affair. On this occasion the train was the 1.20 p.m. *ex*-Darlington, and the load moderate, consisting only of 37 axles, or 265 tons behind the tender. Yet the start was the only feature of the run worthy of mention, as we were doing 42·9 miles per hour 1¼ miles from the start, 51·1 at 2 miles, and 56·3 at Croft Spa, this rate being maintained up the gentle rise to Eryholme. The total time to Eryholme was 7 min. 25 sec.; Danby Wiske was passed in 12 min. 50 sec., but a relaying check intervened before Northallerton, to which point 18 min. were taken. A rather feeble recovery was made from this point, considering we were behind time, a maximum speed of only 66·2 miles per hour being touched at Thirsk, while on the level beyond the rate actually fell to 56·3, and barely exceeded 60 again the whole way to York. The time from Northallerton to Thirsk was 8 min., from Thirsk to Alne 11 min. 25 sec., and from Alne into York 13 min. 10 sec.—total 50 min. 35 sec. gross or 49 min. net for the 44¼ miles from Darlington. As the schedule is one of 51 min., this surely should allow for some recovery of time with so easy a road and load.

I will take one run from a collection intended for the next issue, to show the speed capacity of the large 999 class 4–4–0 engines on the Midland Railway, now that Mr. Fowler has added superheaters to certain of them. It will be remembered that Mr. Deeley constructed ten of these engines—Nos. 990 to 999—practically uniform in all respects with his compounds, save for the provision of two simple cylinders, instead of three compound, and of 6 ft. 6 in. driving wheels in place of 7 ft. The addition of superheaters to the simple engines makes the comparisons all the more interesting, and



Photo] [*F. E. Mackay.*

LONDON AND NORTH WESTERN RAILWAY.

2 p.m. down West Coast Corridor Dining Car Express. 4–4–0 locomotive (Schmidt superheater), No. 1759, *Snipe*.

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nine of these engines are now stationed at Carlisle in order to work the Settle and Carlisle line—an eminently suitable sphere of service. On the occasion in question the superheated No. 995 was the engine, and the load a light one of 25 axles, or 160 tons in all. I was travelling in the Edinburgh portion of the 11.30 a.m. express *ex*-St. Pancras, and we had been badly checked from Hellifield over the summit in consequence of the poor running of the Glasgow portion in front, being consequently late into Appleby. The driver set to work to regain the arrears over the last 30¾ miles into Carlisle, allowed 33 min.—not so easy a task as many might imagine, as this mainly beyond. But Cotehill, 24 miles from the start, was passed at 73·8 miles an hour in 22 min. 25 sec., and we then eased off considerably, having time well in hand. Scotby, 28 miles, was passed in 25 min. 50 sec., and, running cautiously into Carlisle as usual, we completed the 30¾ miles in exactly 29¾ min., arriving ¼-min. early. Curiously enough, this run was made on the same day as No. 5 of the preceding series, thus affording me the rare experience of timing two runs occupying less minutes than miles covered, on one day.

For a couple of examples of what Mr. Fowler's latest superheater "rebuilds" are doing on the West of England line, to which

NORTH BRITISH RAILWAY.

New 4–4–0 locomotive (Schmidt superheater). Designed by Mr. W. P. Reid, Locomotive Superintendent. The engine illustrated above is one of two equipped with superheating apparatus, the remainder of the class using saturated steam. The design is a development of the "Scott" class. Leading dimensions are: Cylinders, 20 in. by 26 in.; coupled wheels, 6 ft. 6 in.; bogie wheels, 3 ft. 6 in.; heating surface—tubes, 1,166·9 sq. ft., firebox, 139·7 sq. ft., superheater, 295 sq. ft.; grate area, 21·13 sq. ft.; steam pressure, 165 lbs. per sq. in.; weight in working order (engine only), 57 tons 5 cwt. The tender carries 4,235 gallons of water and 7 tons of coal. Its weight loaded is 46 tons.

downhill stretch is broken by several short, but sharply adverse grades. On the falling grades from Appleby start we quickly attained a speed of 70·3 miles per hour in the first 4 miles, passing Culgaith, 7½ miles, in 8½ min. Speed then rose to a sustained 77·5 past Langwathby, and finally to a maximum of 83·3 at Lazonby, which, although 15¼ miles from the start, was passed in the smart time of 14 min. 40 sec. On the adverse 1 in 165 beyond speed fell to a minimum of 63·4 miles per hour. The short descent thence to Armathwaite produced a maximum of 72·5, followed by a further minimum of 65·2 up the 1 in 132 they are mainly confined, I am indebted to the courtesy of correspondents. No. 521, with a load of 30 axles, or 210 tons, on the 9.45 a.m. *ex*-Bristol, made an excellent run. A minimum speed as high as 27 miles per hour was maintained up the 1 in 69 and 81 to Fishponds, and Mangotsfield, 5 miles out, was passed in 10 min. 55 sec. The undulating 10 miles from Mangotsfield to Wickwar occupied 10 min. 25 sec., and on the 5¼ miles' descent at 1 in 281 past that station the speed rose to a maximum of 77·5 miles per hour. A high speed was maintained over the 13¼ miles from Wickwar to Stonehouse, which were covered in 11¾

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min., and the rate only fell to a minimum of 53·5 miles per hour on the 4 rising miles, mostly at 1 in 239 to 277, which culminate just before Haresfield. So, with time well in hand, very moderate running on the down-grade beyond brought the train into Gloucester in 43 min. 5 sec. from Bristol—a gain on schedule of nearly 2 min. over this 37 miles of none too easy road. For comparison, I might quote a run of my own with one of the earlier rebuilds—No. 505—over the same stretch of line, the load in this case being a light one of 130 tons. A minimum speed of nearly 30 miles per hour was maintained to Fishponds, and Mangotsfield was passed in 10 min. 35 sec., despite to Wadborough in 9 min. 20 sec.; the 14¾ miles over the avoiding line from Wadborough to a stop at Bromsgrove occupied 16 min. 20 sec., giving the quick start-to-stop time of 34 min. 50 sec. for the 31 miles from Cheltenham to Bromsgrove. Up the 2¼ miles at 1 in 37·7 which constitute the renowned Lickey incline we were banked as usual, and passed Blackwell, 2¼ miles from the start, in 6½ min., and we then completed the 12 falling miles into Birmingham under easy steam in 14 min. 35 sec. Our total time of 56 min. 35 sec. from Cheltenham to Birmingham showed an improvement of nearly 1½ min. on schedule time, despite the load. My other correspondent's run related to the

Photo] [*E. Mason.*

SOUTH EASTERN AND CHATHAM RAILWAY.

Hastings-London express passing Battle. 4–4–0 locomotive, No. 145.

a severe permanent way check. From Mangotsfield to Wickwar took 11¾ min., and from Wickwar to Stonehouse only 12 min. 5 sec.—a slower time than the foregoing, as a maximum speed of only 73·8 miles per hour was reached on the bank. So Gloucester was passed in 43 min. 55 sec., and, despite a bad signal check beyond, we reached Cheltenham, 43½ miles, in 54½ min., or 51 min. net, the schedule being one of 55 min.

Continuing from Cheltenham, with a considerably increased load of 250 tons, the 6¾ falling miles to Ashchurch were covered in 9 min. 10 sec., and the 9½ level miles thence last-mentioned section of the West of England line, only in the reverse direction. His engine was the superheater 4–4–0 No. 516, and the load one of 184½ tons empty, or probably about 195 tons with passengers and luggage. The 12 miles, entirely rising, from Birmingham to Blackwell occupied 18 min. 25 sec., a stop of 20 sec. being made here in order to test the brakes as usual. Proceeding cautiously down the bank, Bromsgrove, 2¼ miles from the fresh start, was passed in 3¼ min. The 14¾ miles thence to Wadborough occupied 14 min. 20 sec., the 9 miles from Wadborough to Ashchurch 8 min. 40 sec., and the 7¼ miles from

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Ashchurch to Cheltenham 8¾ min., giving the very smart start-to-stop time of 35 min. for the 33¼ miles from Bromsgrove. Despite this hard running, only ¼ min. had been gained on the 54-min. working time allowed from Birmingham to Cheltenham, thus showing that the tight Midland schedules with which we are familiar on the better-known portions of that system are equally in evidence on the section under review.

I apologise for once more turning to the Preston and Carlisle section of the London and North Western Railway in order to illustrate the performances of the 4–4–0 "Precursor" engines of Mr. Whale's design on that line which have recently been equipped with superheaters. I am indebted for the following particulars to the kindness of an old and valued friend, the accuracy of whose observations is beyond question, and thus but one further record is added to the phenomenal achievements of the modern London and North Western express locomotive types. The train in this instance was the 1.37 p.m. *ex*-Preston, booked to Carlisle, 90 miles, in 106 min., making an additional stop at Oxenholme on Saturdays (to detach a portion for Windermere) without any extra time allowance. As a pilot was taken for the Preston-Oxenholme portion of the run, with 49 axles, much of the virtue of the very fast time achieved between these points was lost. Barton, 4¾ miles, was passed in 7 min. 17 sec.; Scorton, 12¾ miles, in 14 min. 21 sec.; Lancaster (at a very cautious rate), 21 miles, in 22 min. 3 sec.; and Carnforth, 27¼ miles, in 27 min. 54 sec.; while Oxenholme, 40⅛ miles, was reached in 41 min. 22 sec., the scheduled *passing* time being 45 min. Here the pilot and three eight-wheelers were detached, and the real interest of the run began. It should be added that a violent gale, with heavy rain, was in progress throughout the run.

I consider the uphill times from Oxenholme start simply extraordinary. The load was 37 axles, or 265 tons, and the engine No. 2062, *Sunbeam*. Starting on the 1 in 182, the speed had risen to 23·5 miles per hour at the end of the first ½-mile, and at the end of the succeeding 2¼ miles, the first half of which are inclined at 1 in 105, and the second at 1 in 120, to 41 miles per hour. At this point the most phenomenal feat of the whole journey was recorded, a speed of 48·7 being maintained for a full half-mile on the succeeding 1 in 133, followed by 2 miles over which an absolutely unbroken rate of 47·4 miles per hour was sustained. The length of the 1 in 133 is 2¼ miles, so that this wonderful speed was carried forward for ⅜-mile on to the final 1 in 100. On the last 1¼ miles at this inclination the rate fell back to a minimum of 42·9 miles per hour, and Grayrigg, 7 miles from the start, was passed in 11 min. 23 sec.—a clear gain of 39 sec. on the fastest time recorded on any of the runs shown in my April table, as from a start at Oxenholme.

A smart run followed to Tebay, only 5 min. 54 sec. being taken for the 6 miles, with a maximum of 67·7 miles per hour at the troughs, and there then succeeded the fastest climb to Shap summit that I have ever seen on record. At the end of the 1¾ miles at 1 in 147 past Tebay station the speed had not ever fallen below the mile-a-minute rate, and at the conclusion of each of the successive miles at 1 in 75 up Shap incline the speeds recorded were 50, 43·6 (the third was not exactly secured, but from adjacent mile-posts would be about 36), and 27·3 miles per hour, the last-named being the absolute minimum. The wind on the exposed upper part of the climb and the wet state of the rails would doubtless account for the falling off in speed at the finish, as compared with the other runs, but, despite this, the 5⅝ miles from Tebay to summit had been covered in 7 min. 29 sec.—average *forty-five miles per hour!* Consequently, the total time from Oxenholme start to Shap summit, 18⅝ miles, was one of 24 min. 46 sec., giving an average speed of 45·2 miles per hour from the start! Naturally, this run leaves the best previously recorded runs of *Cyprus* and *Defiance* entirely in the shade. The remainder of the run into Carlisle was marred by unduly cautious running downhill, and a bad permanent way check at Penrith, but even then the total time from Oxenholme to Carlisle was only 60 min. 21 sec. for the 49⅞ miles from Oxenholme, and this might have been 54 min. with the downhill speeds I have known on some runs! It is not too much to say, therefore, that in addition to the valuable properties of superheated steam on locomotives designed for its use, the addition of superheaters to existing types is also improving their work almost out of recognition.

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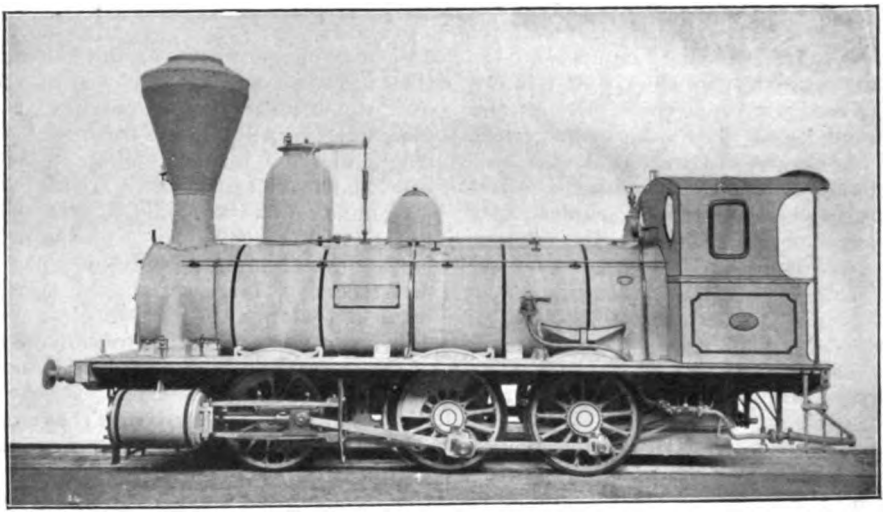

BREST, LITOVSK AND SMOLENSK LOCOMOTIVE.
Built by Kitson & Co., of Leeds, in 1871.

Leaves from the Log of a Locomotive Engineer [No. X.].

By ROBERT WEATHERBURN.

RIGA AND THE WORKSHOPS.

THE novelty and charm associated with the Far East and other sunny lands—with their flora, and fauna, flowing robes, light drapery, or the absence of such—are often productive of stilted nonsense and false enthusiasm. But, charitably, it may be said that all are true according to time, condition and manner of viewing. Admiration evoked by a Tintoretto or a Claude, does not detract from the merits of a Ruysdael, a Rubens, or even a Constable. Those who have entered Russia by way of the Baltic provinces will bear me out when I state that there is a quaintness and a charm about the old town of Riga, with its changeful history, its many distinct peoples—Esthonians, Livonians, Courlanders, Scandinavians, Poles, Germans, and Russians, not forgetting the ancient Letts who, like the Jews, are to this day distinct in lineage and language—which would more than rival the most chequered of Levantine towns.

At one time a trading station of the Hanseatic League, whose commercial power and political influence extended from the Elbe to the Thames, from Bergen to the Gulf of Finland, including all tributory and adjacent towns of importance on the shores of the North Sea and Baltic. Around its old walls, now hardly in evidence, surged the beleaguering hosts of the alternating powers of the North. Conquering or conquered, militant, or suffering, it still maintained its commercial instinct vital and intact. When its inhabitants were reduced to the last extremity, "Hunger Cummer," by the overwhelming beleaguering forces of Peter, they exacted from that stiff-necked monarch, before capitulating, certain rights and privileges of law, speech, and taxes unknown to any other town or province of the Russian Empire. Hence the proud boast of its citizens, "*Ich bin ein Rigenser*"—the pledged word of its merchants were a synonym for honest dealing. No wonder, with my former unpleasant experience of St. Petersburg—its irritating delays, obstructive officialism, and unreliable canals—it came as a relief when Riga had been selected as the centre of future operations and the place of debarkation and of workshops for the erection and painting of locomotives prior to their despatch to the distant parts of the vast Empire. No more unloading into crazy old barges, leaking at every seam, and requiring constant baling

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to keep them afloat at Cronstadt, and waiting weeks for their passage up the Neva, thence through the ill-regulated traffic of the tributary canals, with many blocks and interruption from water held up by contrary winds before arrival at the wharf.

Riga on the Duna, has capacious and well-built wharves, at which steamers of from 2,000 tons to 3,000 tons can berth with ease and safety, and at once unload into railway trucks. The Riga and Dunaberg Railway Company, originally built and engined by English enterprise, forms a junction at Dunaberg with the "Grande Societe" Railway, which runs from St. Petersburg to Eydthulmau into Prussian Poland, also *vid* the "Embranchissement a Warsovie" into Austrian Galicia. It possesses the further advantage of connection with the Witepsk Orel and Kursk and Kieff Railway to Moscow and Odessa, and certain regions of the Volga. The partial building and fitting up of workshops exclusively consisting of wood was a novel and pleasant preliminary to the advent of the first consignment of locomotives.

We were not lacking in neighbours, the rival firm of Sharp Stewart, of Manchester, being located only a short distance away. The most pleasant relations existed between the staffs of both firms, without in the least impairing the competitive spirit which animated each—an incentive which is always the secret of success. Excellent unskilled labour was to be had, and only a small trained staff of Englishmen were required. Owing to the absence of suitable cranes, engines and tenders had to be wheeled by hand, *i.e.*, by using screw jacks, packing being abundant, and cheaply obtained. Despite these drawbacks and also the inalienable right of the pronounced grumbler, it would have been difficult to find a more contented, if, indeed, a happier community. All understood the importance of making the most of the short summer at our disposal. Our recreations, if few, were hearty; the townspeople were kind, even to indulgence to the occasional esoteric displays which unhappily distinguish some Englishmen when abroad.

When the first engines took shape, and were turned out painted and polished prior to being dispatched to their destination, the inhabitants showed their interest by coming in crowds, and seemed as proud of the display as if they had been produced by their own industry. At Dunaberg and Witepsk the same kindly interest was shown by the better class of people, and it gave rise to a poetic production, a couplet of which will be enough:—

"In shimmer of paint and glitter of brass,
Dip your leading springs low as Witepsk you pass."

As stated, the two premier coun ies Yorkshire and Lancashire were represented by firms of old-established repute, well able to uphold the best traditions of English locomotive engineering against French and German, although be it remembered that many of the locomotives manufactured and delivered—as in the case of the Moscow and Riazan and those later for the Brest Litovsk Railway—were built to foreign designs. For instance, the contract for the former was originally given to the French firm of Schneider & Cie, of Creusot, some time before the outbreak of the Franco-German war, and as a consequence of the inability to deliver through hostile territory, the order was, with drawings and specifications, transferred to Kitson & Co. This accounts for their unmistakable foreign rig and general un-English appearance, as formerly mentioned.

In no case were any of these engines steamed or tested in Riga. That process was reserved for the place of their ultimate delivery. All narrow-gauge engines, as in the case of the Livny and Jaroslaw and Vologda Railways, were loaded on trucks, and erected at the depôts stipulated—unfortunately in midwinter in those instances.—It was after a weary period of isolation and suffering from the intense cold, rendered still more trying by scarcity of provisions, on the Livny Railway, that we returned to Riga, where every comfort from which we had been for some time debarred was to be enjoyed, and that, too, with natures sharpened and rendered almost wolfish by enforced abstinence. The old town was like a haven of rest, and we rejoiced like children at the change. Its harbour was still frozen, and our time was our own until the opening of navigation in the late spring, our relaxation being rendered the more agreeable by the knowledge that thus far all had been well done.

Now was a favourable opportunity of carrying out a little affair which we English had long contemplated, namely, to give a substantial proof of our gratitude to one "Captain Liemcke," a hardy, bluff, good-tempered Baltic veteran, who had the piloting and berthing of the Wilson Line steamers, and to whom we were all more or

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less indebted for many acts of kindness. Liemcke and his steam tug *Napoleon* were better known to us than any other feature of Riga life, and the Englishmen of both firms were unanimous and enthusiastic in making the occasion a success. Kay, the representative of Sharp Stewart, and I, were empowered to purchase a gold watch and guard, to prepare an address and make suitable arrangements for a dinner and entertainment. The chief difficulty was the programme of songs and speeches, without which it would not have been *en règle*. As we all know, some men are born singers, or ought to be, while others cannot "grind out" a stave. Nevertheless, it was deemed necessary to give scope to each man's forte.

It so happened that, with the first consignment of the Fairlie double bogie engines from Sharp Stewart, one Benjamin Aspinall was sent out to assist in their erection. Aspinall was a typical "Lancashire Mon," of a most genial and merry disposition, and during his sojourn in the wilds of Werchovia (Livny Railway) he had enlivened the miserable evenings spent in the murky lamp-lit room, by singing the song long since forgotten by many—

"Champagne Charley is my name, good for any little game, my boys."

So, at least, the chorus went, and with it we had all been familiar in wind and snow-swept Livny. The song had evidently become the "rage" in England since we had left, and Aspinall was the first to introduce it. It was his one and only song. We had provided in the programme something appropriate for each one, but when it came to Aspinall's turn we felt that "Champagne Charley" was a little too bacchanal for our liking, and as that represented the whole of his repertoire, we were at a loss. Kay said it was a pity that none of the songs made reference to the guest of the evening, and to release us from the dilemma suggested that I should compose a parody on "Champagne Charley," so that we could fit the impromptu words to the tune. Dinner and presentation went off splendidly, and Aspinall acquitted himself with the parody to every one's satisfaction, although he never read the words before the evening in question. Here is my version which has never, until now, appeared in print :—

Song.—"Ben Bogie is my Name." Tune: "Champagne Charlie is my Name."
Sung by Benjamin Aspinall.

1

I sailed away from Hull in one of Wilson's ships,
She's noted, is the *Otto*, for making famous trips;
We had a jolly captain and lively shipmates all,
But if you ask who was the man, I say Ben Aspinall.

Chorus.—Ben Bogie is my name,
Double Fairlie's are my game;
Good for any game to-night, my boys,
And always ready for a spree.

2

When we got to Bolderaa, I knew not what to say,
Till Liemcke's tug *Napoleon* got nicely under weigh.
When floating up the Düna I heard a friendly call
From Livny's gallant heroes to welcome Aspinall.

Chorus.—Ben Bogie is my name,
Double Fairlie's are my game, &c.

3

In fitting up a loco., a Moscow or Smolensk,
A Tamboff, or Saratoff, a Bologoi or Brensk,
You'll always find me willing, and ready to your call;
But chiefly at the bogie you'll find Ben Aspinall.

Chorus.—Ben Bogie is my name,
Double Fairlie's are my game, &c.

4

We've met to-night in order our great esteem to show
To worthy Captain Liemcke, a friend you all well know.
With Kay at the lever, the brake in Howarth's call,
Conductor stop, don't leave behind Ben Bogie Aspinall.

Chorus.—Ben Bogie is my name,
Double Fairlie's are my game:
Good for anything to-night my boys
Always ready for a spree.

[The original MS. of the song was afterwards taken to Manchester and became very popular at some of the Music Halls in the neighbourhood of Sharp Stewart's works, where the Fairlie Double Engines were built.]

All the main railways in the dominions of the Czar are built to the 5 ft. gauge, and strategy has thus given an ideal width, which affords utmost relaxation to the designer who, in England, is always more or less striving after the unattainable when

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dealing with the 4 ft. 8½ in. gauge, allied as it is with structural limitations. With the exception of America, no other country gives such an elastic margin. With the omission of a few on the Dunaberg and Witepsk Railway (now obsolete), all the engines have outside cylinders, and it is only in the extreme width of cylinders and over-driving crank pins that any limitations are imposed, these being intended to suit the platforms at the principal stations. Hence generous bearings, both in length and diameter, can be used to take up and deal with the stresses consequent on such wide centres. Yet with all these advantages and the fewness of the types compared with this country, not a single satisfactory class had been evolved from a purely maintenance standpoint, which I take to be of chief importance.

The various countries that competed for the business persisted in introducing characteristics and peculiarities of construction which to the technical observer bespoke their origin at a glance. Indeed, with but little experience, the birthplace of the engine and the sign manual of the maker could be identified without reference to the name plate. The Creusot engine was ever the same model, however much it varied in size or application. Those made by Borsig, and Schwartzkopff, or the Hanoverian Gesellschaft were as Teutonic in style as their designers were in utterance, and it was more particularly a matter of detail and finish that served to distinguish one maker of the Fatherland from another. The American type as introduced by the Winans held sway on the St. Petersburg and Moscow. French engines were, with but few exceptions, in evidence on the Grande Société, *i.e.*, from St. Petersburg to Warsaw and to the German frontiers.

For some years, the Riga and Dunaberg was worked by engines built by R. Stephenson & Sons, of Newcastle-on-Tyne. The staff of that railway was entirely English, the locomotive engineer, being Mr. H. Furness, later known in this country as the inventor of that pretty and simple apparatus, the Furness suction lubricator. For many years the staff has been entirely German. Mr. Furness introduced German assistants, to whom he was very partial, and after his departure they signalised their gratitude by banishing every vestige of an English staff and tutelage, introducing engines of German construction principally of the type known as Borsig. No doubt their justification was that the requirements of the line demanded engines of a heavier kind. To the credit of the firm of Stephenson & Sons, it must be stated that, after seventeen years' hard service, their engines were always found more reliable than those of their new German competitors. Indeed, the superiority of the former was as marked and as well known, more particularly in firebox maintenance, as the flagrant attempts to depreciate them by charging a portion of the maintenance of the new stock to the old, a habit, unfortunately, not confined to that railway.

CAPTAIN LIEMCKE, FORMERLY OF RIGA.

The Dunaberg and Witepsk, and Witepsk and Orel Railways were largely engined by Sharp Stewart & Co. until the German *regime* became established. Locomotives of English make and design found their way to the Tamboff and Saratoff and Tamboff and Kasloff, also the Bologoi and Brensk Railways, and many others, and wherever they were sent, when built by such firms as Beyer Peacock, Sharp Stewart, Kitson & Co., they carried the characteristics of their country with them, and established their reputation as being among the very best imported. One or two English firms who got the *entrée* into Russia did not, I am sorry to say, contribute to the excellent record of English work.

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Their samples of the industry of this country were by no means creditable. The result was that at times, we were not flattered to hear unpleasant allusions to indifferent and even bad workmanship. Possibly the belief had been entertained, not unreasonably, that the Russian was indifferent to everything but his own interest, and when that was attended to, little more was required.

At first the only difficulty which placed several of the English builders at a disadvantage was their unconquerable objection to adapt the details of their design to the exigencies of the climate, supplying, for instance, unsuitable injectors badly exposed, whistles often placed where they got frozen and could not be used at the moment when required, undrainable feedpipes—*i.e.*, so placed that after the injectors had been used they were liable to be frozen through being water logged—cylinder and steam chest taps too small in bore, and subject to the same contingency, oil syphon tubes of insufficient calibre, and cylinders not as elaborately and carefully lagged as might be against the cold.

At that time considerable latitude was given to the builders, more particularly in respect of details. German firms, on the contrary, had had years of experience on the East Prussian and Polish railways, where the cold and frost were at times almost as trying as in Russia, and had there been taught by experience that such matters required the closest attention. The majority of the engines built by them for Russia were therefore fitted with the Schau injector, which claimed to be unfreezable, and similar close attention to minor requirements ensured them against many of those irritating delays, and popularised them with the drivers in winter. Perhaps some idea of the intensity of the cold at times experienced may be gathered from the fact that when engines have been compelled to run some distance tender first, thus losing the protection of the cab, the gauge glasses have been known to freeze solid with ice. No doubt this was largely due to the abnormally small water ways from the boiler. Another feature, namely, the variable exhaust, was, and is, employed in many different ways on Russian railways consequent on the great variety of fuel employed, from the birch and pine logs obtainable where forests are abundant and wood cheap, to the many varieties of somewhat inferior coals obtained from the bituminous beds of the South.

Many curious, and some ingenious devices were used to promote and alter draught. These had been unknown to English builders, who, no doubt, looked upon them as unnecessary fads, and applied them in such a crude and half-hearted fashion as to cause severe disappointment to the engineers who had stipulated or designed them. The reconstruction of these details, usually a very unpleasant task, fell to the lot of the *chef monteurs*, and many a difficult situation was relieved and saved by timely remedial measures on the spot. It was natural for the agents or friends of the German firms to magnify the smallest defect or failure in British engines, so that a very trifling matter would be represented as a complete breakdown, or collapse, seven or eight hundred versts away. Personal considerations were often flung on one side to help other English firms whose experience of the country did not enable them to deal promptly with such difficulties.

From the standpoint of an unprejudiced engineer, and in the interest of fair-play, I must say there were only five firms among the dozen of foreign competitors which caused us any concern, and that was more particularly owing to their better equipped commercial connections than otherwise. These were Borsig, Schwartzkopff of Berlin, Hanoverische Gesellschaft, Creusot, and Grafenstaden of Mulhaus. Our superior system and care in case-hardening the motion, and especially the crank pins, served us in good stead, for ofttimes suspended lubrication through neglect in summer and frost in winter would entail disaster where such parts were not thoroughly hardened. At all events, the more thorough the case-hardening, the less liability to delay and damage. Our boiler work was, as a rule, much superior, not excepting those of Borsig & Schwartzkopff, but where they were principally lacking was in the lightness of their motion, coupling and connecting rods. The engines of Beyer Peacock, Sharp Stewart, Kitson & Co., where individual designing had been allowed, were models of simplicity, in comparison with the many fangled roundabout methods of both French and German; and one often heard an involuntary "Sehr praktisch" uttered by some of the more ingenuous of our German critics, in spite of their after qualifications.

Mr. Weatherburn's next Contribution will appear in the August issue of the "Railway Magazine."

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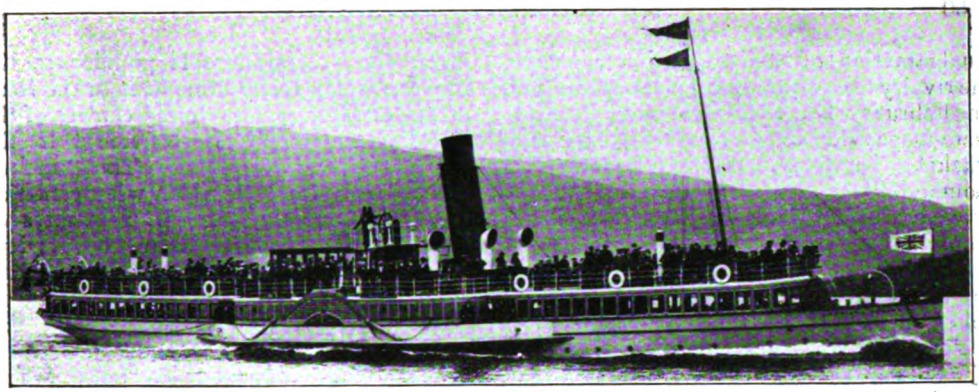

LOCH LOMOND STEAMER *Prince George.*

The Loch Lomond and Trossachs District of Scotland.

By TOM MOFFAT.

THE unrivalled charm of Scottish scenery has so long exercised a magnetic influence over tourists from nearly every quarter of the globe that the writer feels confident when he tells something both old and new regarding the famous Loch Lomond and Trossachs district of Scotland, he will arouse interest among a very large number of RAILWAY MAGAZINE readers.

As a tourist *rendezvous* the delightful country in the vicinity of Loch Lomond and the Trossachs has a history dating back to the early part of the nineteenth century, when its praises were so happily sung by Sir Walter Scott in the most popular of all his poems, "The Lady of the Lake," written in 1810. Tourist traffic was, however, very greatly hampered and discouraged owing to the slow, inconvenient and expensive modes of travelling then in existence. Like other parts of the country, the Loch Lomond and Trossachs district was then accessible only to those belonging to the wealthier and more leisured classes, and its popularity as a tourist centre should perhaps more properly be said to date back, firstly, to the commencement, in 1817, of the steamboat service on Loch Lomond, and, secondly, to the opening, in 1850, of the railway which terminates at the fine pier station at the southern extremity of the Loch.

The first steamboat was placed on Loch Lomond about five years after the successful launching of Henry Bell's famous *Comet*, which was the earliest passenger steamer to ply on European waters. This Scottish vessel, named the *Marion*, after running on the Firth of Clyde for twelve months, plied upon the River Leven, and, thus inaugurated what is now one of the finest fleets of steamers on inland waters. It is also worthy of note that just as the first steam vessel upon its waters reached Loch Lomond nearly 100 years ago, so still are all new vessels built at the Clyde shipyards for service on the Loch taken up the River Leven. The *Marion*, which was 60 ft. in length, with 13 ft. beam, was a 20-horse-power vessel of 57 tons burden. From this humble beginning has followed the remarkable fleet of steamers which now maintains the services on the "Queen of Scottish Lochs."

Improved facilities afforded by the pioneer vessel resulted in a considerable increase in the traffic on the loch, and after the *Marion* had done good work for a number of years, the owner, finding it necessary to substitute a larger steamer, put in its place the *Euphrosyne*. The success of this enterprise was such that a rival company, known as the Loch Lomond Steamboat Company, was formed, and from the launching of the first opposition boat, *The Lady of the Lake*, in 1825, keen competition was for many years witnessed between the rival steamboat owners who exploited the traffic on the loch. In course of time, however, the Steamboat Company obtained a firm hold on the traffic, and, except for a very brief interruption, from the year 1845, when the New Loch Lomond Steamboat Company was established by an

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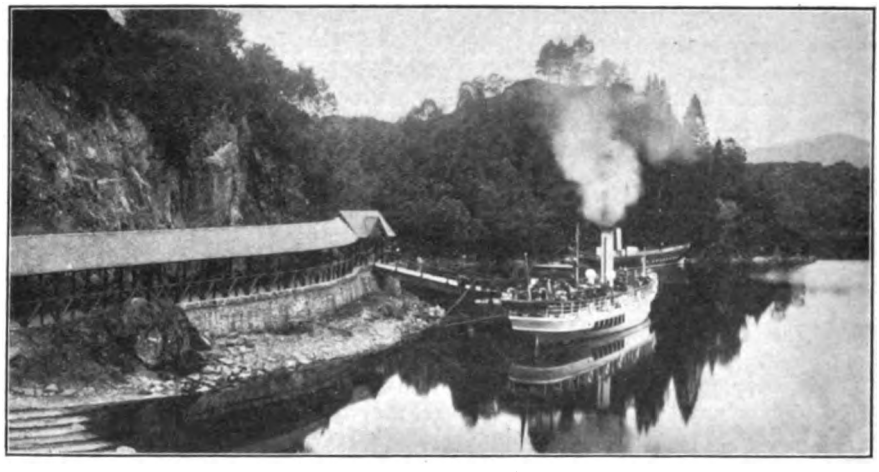
amalgamation of the opposition concerns, the rivalry disappeared. Upon its dissolution, on February 21, 1889—when its interests were disposed of to the North British Steam Packet Company, Limited—the Loch Lomond Steamboat Company was said to have been one of the oldest steam packet companies in Europe. Its operations were carried on in a most satisfactory manner for a period of nearly 44 years, and when sold to the Steam Packet Company, it realised the handsome sum of £30,000.

The prosperity and success which had all along attended steamboat services on Loch Lomond did not wane during the seven years the North British Steam Packet Company, Limited, controlled the traffic arrangements on the Loch, and the various improvements in the tourist facilities inaugurated by them went a long way to build up the valuable traffic controlled by the Joint Committee now owning and working the steamers. The fact that the North British Steam Packet Company, were when they took over the steamers of the Loch Lomond Company, firmly established as a going concern on the Firth of Clyde, placed them in an exceptional position for still further developing the traffic on the loch. At the time the steamers came into their possession the Steam Packet Company's operations on the Firth of Clyde consisted principally in the maintenance of the connections for the through services of the North British Railway to and from the various Clyde coast resorts *viâ* Craigendoran Pier.

While the Loch Lomond and Trossachs District of Scotland was, in pre-railway days, one of considerable popularity, the impetus which really brought it to the front as one of the foremost tourist centres of the world can undoubtedly be traced to the advent of the iron road. The "main" line to Loch Lomond, which was opened on July 15, 1850, and which terminates at Balloch, was formed as an independent concern by the Caledonian and Dumbartonshire Junction Railway Company, incorporated by an Act of June, 1846, and extended as far as Bowling, on the Firth of Clyde, a distance of 8½ miles. This undertaking was merged in the Edinburgh and Glasgow Railway Company, under powers contained in an Act of July 7, 1862, and in turn the latter Company was taken over by the North British Railway in accordance with the provisions of the North British and Edinburgh and Glasgow Railway Companies Amalgamation Act, which received the Royal Assent on July 5, 1865.



TROSSACHS PIER, LOCH KATRINE.

From Glasgow the Bowling-Balloch line is now served by the railways of both the North British and Caledonian Companies. By the Act of 1865 the North British also came into possession of the line between Glasgow (Cowlairs) and Bowling which was formed by the Glasgow, Dumbarton and Helensburgh Company under their Act of August 15, 1855, and so completed their through route between the Western Metropolis and Loch Lomond. This line was opened for traffic in May, 1858.

The Caledonian Company's line between Glasgow and Dumbarton (17¼ miles) was formed as an independent undertaking by the Lanarkshire and Dumbartonshire Railway Company under powers contained in an

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Act of Parliament of August 5, 1891, and was opened for traffic on October 1, 1896. When this scheme was first promoted, powers were asked for a line terminating at Aber Bay, on the south shore of Loch Lomond, and on the application being renewed in the following year negotiations were entered into between the interested companies, resulting in the withdrawal of the extension scheme and the vesting, under the joint line Act of 1892, of the Loch Lomond steamers and the North British Company's line between Dumbarton and Balloch Pier in a Joint Committee representing the North British, Caledonian and Lanarkshire and Dumbartonshire Railway Companies. The last-named Company was merged in the Caledonian Railway as from August 1, 1909, so that the Dumbarton and Balloch Joint Line Committee, which works and controls the Balloch line as well as the service on Loch Lomond, now comprises the two principal Scottish railway companies.

STEAMER *Sir Walter Scott* ON LOCH KATRINE.

While the most popular route to Loch Lomond and the Trossachs is undoubtedly that *viâ* Balloch, the district is tapped at so many points by both the North British and Caledonian Companies that the intending tourist has a wide and varied selection of tours embracing the various routes. On the West side the loch is approached by a coach drive of slightly under one mile from Arrochar, at the head of Loch Long, where the North British Railiway Company's fine fleet of Clyde steamers calls regularly in connection with the combined tours. About halfway across this isthmus dividing the salt water from the fresh the North British Company's West Highland line from Glasgow and the south and east comes into view, after having wended its way along the mountainside high above Loch Long. It immediately strikes the western shores of Loch Lomond, and at considerable altitudes follows the water's edge right up to Ardlui, at the head of the Loch, revealing at every turn rare glimpses of Highland scenery of majestic grandeur. Immediately beyond Ardlui—where there is a West Highland line station—the railway plunges into a maze of mountains, through Glen Falloch, and continues its northward journey, running for a considerable distance parallel to the River Falloch, which feeds Loch Lomond. Turning to the eastern side of the Loch, we find the only access at Inversnaid, which is reached by coach through the famous Pass of the Trossachs. In this direction there are two routes—that of the North British *viâ* Aberfoyle, and that of the Caledonian *viâ* Callander. The Aberfoyle line was constructed as an independent undertaking by the Strathendrick and Aberfoyle Railway Company, and opened for traffic on August 1,

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1882, while Callander is, of course, on a branch line of what was originally the Scottish Central Railway, and formed the nucleus of the Caledonian Company's system.

The tourist facilities afforded by both the North British and Caledonian Companies for visiting the Trossachs and Loch Lomond are so ample and complete, and the country reached is so unique and impressive in its grandeur, that an American visitor very aptly though somewhat bluntly described the district as "the canned essence of Scotland, and mighty handy to get at." This romantic countryside can best be visited by what is sometimes called the "Grand Tour" of the Trossachs, embracing one of the finest and most interesting single-day trips that is available to the tourist in any part of the world. Comprising a variety of delightful rail, coach and steamer journeys, the tour can be made from either Glasgow or Edinburgh, going *viâ* Balloch, and returning *viâ* Aberfoyle or Callander, or *vice versa*. Leaving Glasgow or Edinburgh by the morning train, the traveller is taken to the fine Pier station at Balloch, where he finds a carriage drawn up alongside the gangway of the trim little loch steamer, in readiness to convey him on his pleasant day's journey. From the pier at Balloch a magnificent panorama of water and hills stretches out as far as the eye can reach. Balloch, standing at the southern extremity of the Loch, is prettily situated on the River Leven, which is spanned by a fine iron bridge just after passing out of Loch Lomond. Many fine mansions of eminent Scottish families are within short distance overlooking the Loch, and the village is a busy centre during the season for the large number of houseboats, motor-boats, and other pleasure craft, which form such a conspicuous feature of this lovely sheet of water.

One of the outstanding charms of Loch Lomond (nearly 24 miles in length) is the beautiful islands, numbering about 30, which are passed in succession during the voyage. Many of them are richly wooded, and their great variety of size and form render to the Loch a continuous change of the most picturesque and pleasing description. At many points the islands seem to present an impassable barrier to the steamer, and some of the most beautiful views obtainable on the Loch burst upon the traveller as the vessel wends its way round and between these islands. Shortly after leaving Balloch, the steamer enters the broadest portion of the Loch—about five miles—and passing Inch Murrin (the largest island) a gorgeous view is revealed in the extended valley of the Endrick, Ross Priory, associated with Sir Walter Scott, being close at hand on the mainland. After calling at Balmaha the boat strikes in a westerly direction, and touches the opposite shore at the charming hamlet of Luss, which is not only lovely in itself, but from above it there can be got a gorgeous view of the islands and richly-wooded promontories jutting far out into the Loch from either side.

After Luss the traveller will the more readily observe the Loch narrowing down and the beautifully wooded banks coming more closely together. Returning again to the eastern shore, the steamer calls at Rowardennan, where land travellers who are bent on ascending Ben Lomond (3,192 ft.). Beyond Rowardennan the Loch narrows down to about half a mile in breadth, the mountains become higher and grander, and the whole scenery as the vessel nears Tarbet, on the west shore, is so remarkable that exclamations of admiration are called forth from all on board. At Tarbet there is an unparalleled combination of mountain scenery, embracing Ben Lomond, Ben Voirlich, and Ben Arthur, or "The Cobbler," as it is commonly called. Tarbet is the point where passengers leave the steamer when desiring to walk or drive across to Arrochar, at the head of Loch Long, and to return by steamer to Craigendoran Pier station, on the Firth of Clyde, where connecting trains to Glasgow await the arrival of the boats. There is also Arrochar and Tarbet station on the West Highland line available for travellers who choose to return by rail throughout.

Setting off from Tarbet Pier, the Loch Lomond steamer skirts the base of Ben Lomond, and makes a call at Inversnaid, prior to the final stage of its journey to Ardlui, at the head of the Loch. At Inversnaid travellers returning *viâ* the Trossachs leave the steamer, and join the tourist coaches in waiting. The famous waterfall here is the outflow of Loch Arklet, and it reaches the Loch over a precipice descending in a beautiful cascade of two steps. From Inversnaid the coach road to Loch Katrine lies through six miles of beautiful country. After a steep climb up the mountain side the wild Glen Arklet is passed through, and

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when the loch of that name, a mile or two farther on, is reached, the tourist finds himself in the very heart of the romantic Rob Roy country. At Stronachlacher the pretty little steamer, very appropriately named the *Sir Walter Scott*, is boarded, and the delightful voyage is then made along the whole length of lovely Loch Katrine, affording to the tourist superb views of Ben Venue, as well as such well-known landmarks to lovers of Scott as "Ellen's Isle" and "The Path by the Loch."

Loch Katrine, a fine stretch of water, eight miles in length, is the reservoir for the city of Glasgow's water supply. It is 364 ft. above sea level, and the aqueduct for conveying the water is 34½ miles long. After quitting the steamer at the rustic

LOCH ACHRAY AND TROSSACHS HOTEL.

Trossachs Pier, the coaches are again joined and the journey continued through the famous Pass of the Trossachs, about a mile in length. Again, the American tourist's description is tempting. He averred that there was more magnificent scenery to the square yard of this stretch of country than Nature had been able to pack into any other area on God's earth. Almost suddenly the coach emerges from the gloom and wild grandeur of the rugged mountain pass to reveal the radiant face of peaceful Loch Achray, where at the Western end the coach routes to Aberfoyle and Callendar diverge. Close at hand, standing on the northern shore of the Loch, the noble and stately building of the famous Trossachs Hotel, in the Scottish baronial style, at once commands admiration. The Aberfoyle coach then strikes southward, and passes for nearly the whole seven miles of its journey over the Aberfoyle and Trossachs private road, formed nearly 30 years ago at considerable expense, through the lands of the Duke of Montrose. Hemmed in by giant heather-clad mountains, the road opens up scenery of the wildest and grandest description in the Scottish Highlands.

At various points the views obtained are exceptionally fine, especially at the summit, where a grand panorama is opened up of the valleys of Loch Achray and Loch Vennacher, with Ben Ledi (2,875 ft.) and Ben Venue (2,393 ft.) standing sentinel alongside. Farther on Loch Drunkie is passed, and as the coach descends the winding mountain road high above Aberfoyle a fine view is obtained of the River Forth, with Loch Ard to the right and Ben Lomond beyond. The Clachan of Aberfoyle, figuring prominently as it does in "The Lady of the Lake," "Waverley," and "Rob Roy," is an ideal tourist Highland resort, and the headquarters of the coaches which maintain communication with the mountainous country beyond are very appropriately found at the Bailie Nicol Jarvie Hotel, Jean Macalpine's primitive inn. Aberfoyle is the terminus of the North British Railway Company's branch line, and there the train is in waiting to convey the tourist back to either Edinburgh or Glasgow in time for

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dinner. Returning to the Trossachs Hotel, the Callander coach follows the beautiful shores of Loch Vennacher, past the historic Brig o' Turk, Lanrick Mead, the Macgregors' muster place, and Coilantogle Ford, immortalised in the combat between Fitz-James and Rhoderick Dhu. After passing along the base of Ben Ledi and the famous Pass of Leny on the right, it crosses the River Leny and enters Callander. Here the Caledonian Railway is joined, and tourists reach their destination at approximately the same times as those who return by the alternative route.

The Loch Lomond service is maintained by one of the finest and best equipped fleets of steamers plying on inland waters, and the trim little vessels add a charm and picturesqueness to the scenery on the Loch. They are fitted in a luxurious style, and the comfort of passengers is catered for in every way. The latest addition to the fleet is the *Prince Edward*, which was built at the Pointhouse shipyard of the famous Clyde firm of Messrs. A. and J. Inglis, Ltd., and taken up the River Leven to Loch Lomond last year. It is a fine paddle steamer 175 ft. in length and 22 ft. 1 in. in breadth, painted in the same pretty and striking colours as the other vessels of the fleet, her grey hull and red funnel relieved by a band of black. Her engines are of the diagonal compound jet condensing type; steam is generated by a haystack boiler, with a working pressure of 110 lbs. to the square inch, and there is electric illumination throughout the vessel. The fleet now comprises the following vessels :—

Vessel.	Length.	Gross Tonnage.	Indicated H.P.	Speed. Knots per Hr.
Prince Edward	175 ft.	303·76	900	15
Prince George	165 ft.	256·48	700	14½
Princess May	165 ft.	256·48	700	14½
Empress ..	165 ft.	228·53	—	14

The voyage from Balloch, the headquarters of the fleet, to Ardlui, the most northerly pier on Loch Lomond, usually occupies 2 hours 10 min.

The SUSSEX HIGHLANDS
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A NEW NOTE IN "BRIGHTON" RAILWAY POSTER PUBLICITY.

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To Ireland *via* Fishguard:

THE CHOICE OF THREE STEAMER ROUTES.

By DENIS O'DONOGHUE.

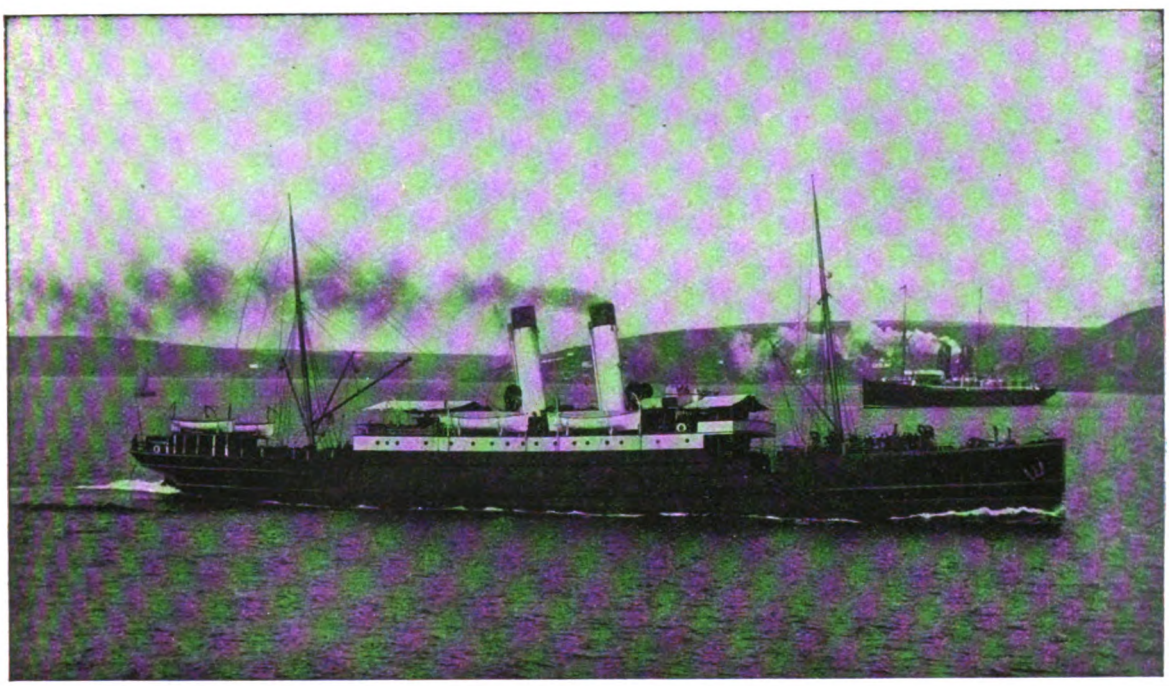
TWO men met in the Underground train going Citywards in the autumn last year.

"Hullo!" said the first, "back from your holidays?"

"Yes," replied his friend, "I did the South of Ireland last month. You always go to Ireland for the summer holidays don't you?"

"that you go by the Fishguard route if you go near Cork? I went by that way and had a first-rate journey. I left London just before nine in the morning, and was in Killarney the same night. It isn't nearly such a fatiguing journey as people who have not done it imagine."

"Yes," answered his friend, "Of course Fishguard suits me, but I don't go by the



STEAMER FROM FISHGUARD ENTERING CORK HARBOUR. CUNARD STEAMER WAITING FOR AMERICAN MAILS.

"Yes, I have spent the summer vacation for a good number of years at a little village near Cork. It suits me. I take it easy there, and spend the days fishing and sailing with a little golf thrown in, and get to bed early. The air is like champagne, and altogether I feel twice the man after my holiday."

"Then I suppose," added the other, Rosslare boat. I go at night by the Cork boat."

"Oh! I didn't know there was a steamer sailing from Fishguard to Cork."

"Yes. Three nights a week each way. Did you know there's also a steamer service between Fishguard and Waterford?"

"No. I only knew of the Rosslare boats."

This imaginary conversation illuminates

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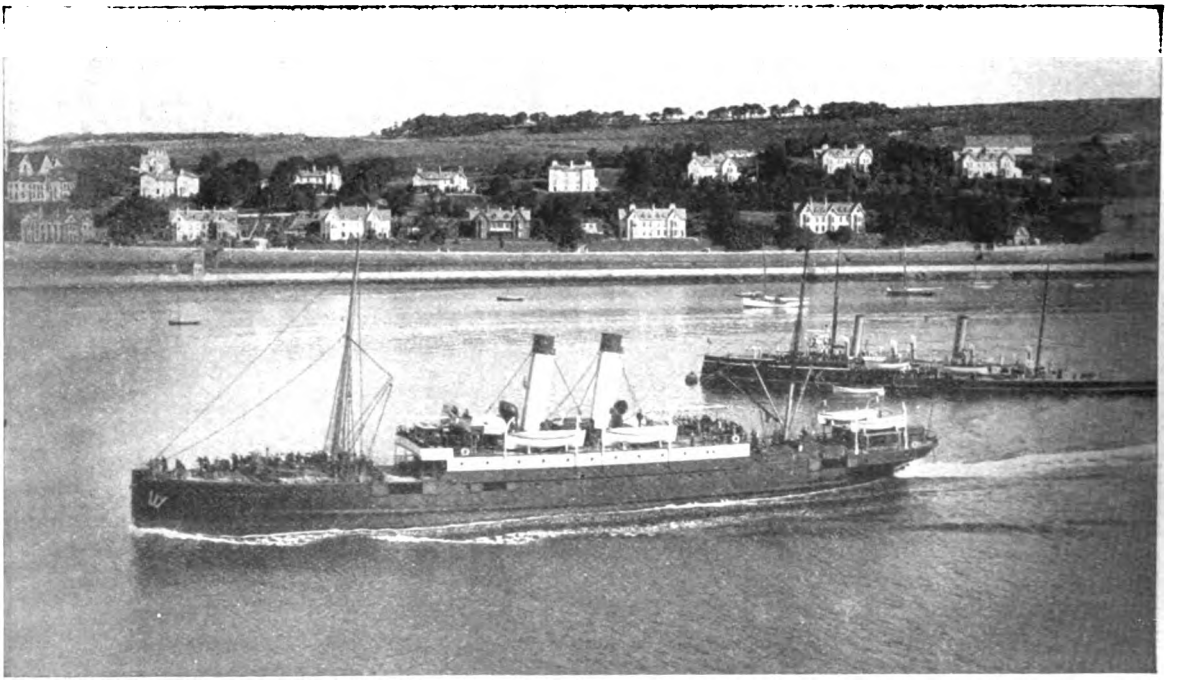
what may well be not an isolated case of ignorance on the part of the traveller regarding the variety of routes afforded the passenger to Ireland journeying *vid* Fishguard Harbour. The choice of three steamer routes from the port of Fishguard to the South of Ireland may not be common knowledge even to the careful man. So much has been written of the Fishguard route to Ireland, and so widely has the service by Fishguard and Rosslare been advertised by the Great Western Railway Company since the inauguration of the service in 1906 that the short-sea route to Ireland must be well known, if only by repute, to all who use railways for making journeys of any distance, and to many who never make a long journey at all.



PASSING QUEENSTOWN. CROSS-CHANNEL STEAMER INWARD BOUND.

If so much be postulated, then a review of the three Fishguard ways is worthy of endeavour, and an examination of their respective merits as applied to the needs and predilictions of Anglo-Irish travellers perhaps not out of place.

If a line is drawn across Ireland from Dublin in the East to Clifden on the coast of Connemara in the West, through Athlone and Galway, the whole of the country to the South of the line is most accessible to passengers from the West and South-West of England and South and Central Wales *vid* Fishguard. Passengers from the South of England, London, the Home Counties, the Midlands, and all who have to go to the Metropolis to start their journey proper to Ireland will find the Fishguard route equal to any other for reaching the Southern half of Ireland, the balance in favour of Fishguard increasing the more southerly be the destination station in Ireland. Travellers from certain parts of England and Wales will, of course, find the Fishguard route the best for reaching any place in Ireland, and the foregoing criticism is simply an attempt to discriminate fairly, bearing in mind the many other routes open to selection by those making the crossing between England and Ireland. Indeed, the means of communication between the two islands are now on such a lavish scale that travellers may be excused for hesitating to make a choice between the many competing routes, and in many instances it would be invidious to attempt anything in the nature of a comparison.

The Summer time-tables of the Fishguard

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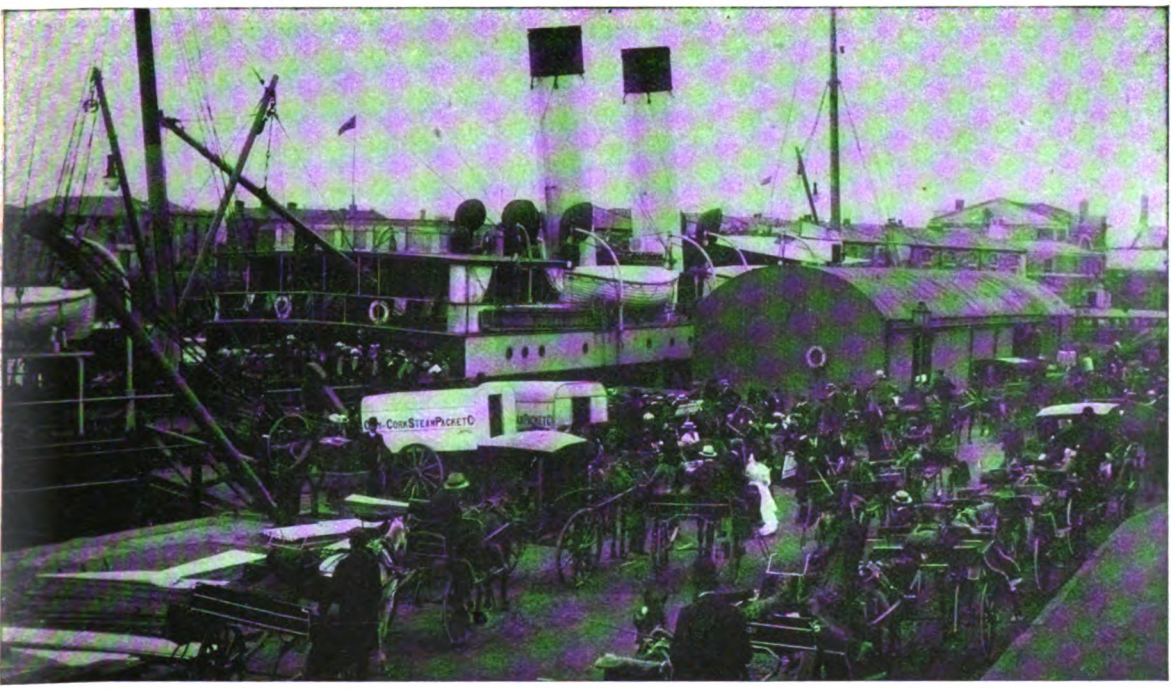
route provide two services daily in each direction *viâ* Rosslare. A day boat train leaves Paddington at 8.45 a.m., and calling at Reading, Newport, Cardiff and Landore is timed to arrive at Fishguard Harbour at 2.15 p.m. This steamer arrives at Rosslare at 4.50 p.m. and an express train leaves for Cork, calling at Waterford at 6 p.m., Mallow at 8.14 p.m., and other principal stations, reaching Cork at 8.50 p.m. Connections are given from Waterford to Dublin *viâ* Kilkenny and Kildare, Dublin being reached at 10.20 p.m., and to Clonmel, Tipperary, and Limerick, etc., for connections from the Limerick line and from Dublin, and is due at Rosslare Harbour at 12.20 p.m. The Dublin and South Eastern Company run a train from Dublin *viâ* Kingstown, Wicklow and Wexford in connection with the sailing of the steamer, which arrives at Fishguard Harbour at 3.55 p.m. The boat express leaves at 4 p.m., and is booked to arrive at Paddington at 9.35 p.m. In both directions the night service follows closely the lines of the day service, the timing being 12 hours later.

Restaurant Cars for breakfast, luncheon and dinner are formed in the day and night



PASSENGERS DISEMBARKING AT CORK.

passengers being due in Limerick at 8.58 p.m. From Mallow a connecting train serves the holiday country of Kerry arriving in Killarney at 10.2 p.m. A connecting train runs over the Dublin and South Eastern Railway *viâ* Wexford, Wicklow and Kingstown to Dublin. Travellers from places as far apart as Portsmouth, Exeter, Aldershot and Birmingham have train services to connect with the day steamer from Fishguard to Rosslare. In the other direction a boat train leaves Cork at 8.30 a.m., calling at Mallow for connections from Killarney and other stations, at Waterford boat trains on both sides of the channel, and in connection with the night boats a sleeping car is attached to the boat trains from London to Fishguard Harbour and *vice versa*.

For the daily steamer from Fishguard Harbour to Waterford a boat train leaves Paddington at 4.30 p.m., equipped with dining and buffet cars and is due at Fishguard Harbour at 11.15 p.m. The vessel sails at 11.45 p.m., and should berth at Adelphi Wharf, Waterford, by 7.35 a.m. In the reverse way the boat leaving Waterford at 5 p.m. arrives at Fishguard in time

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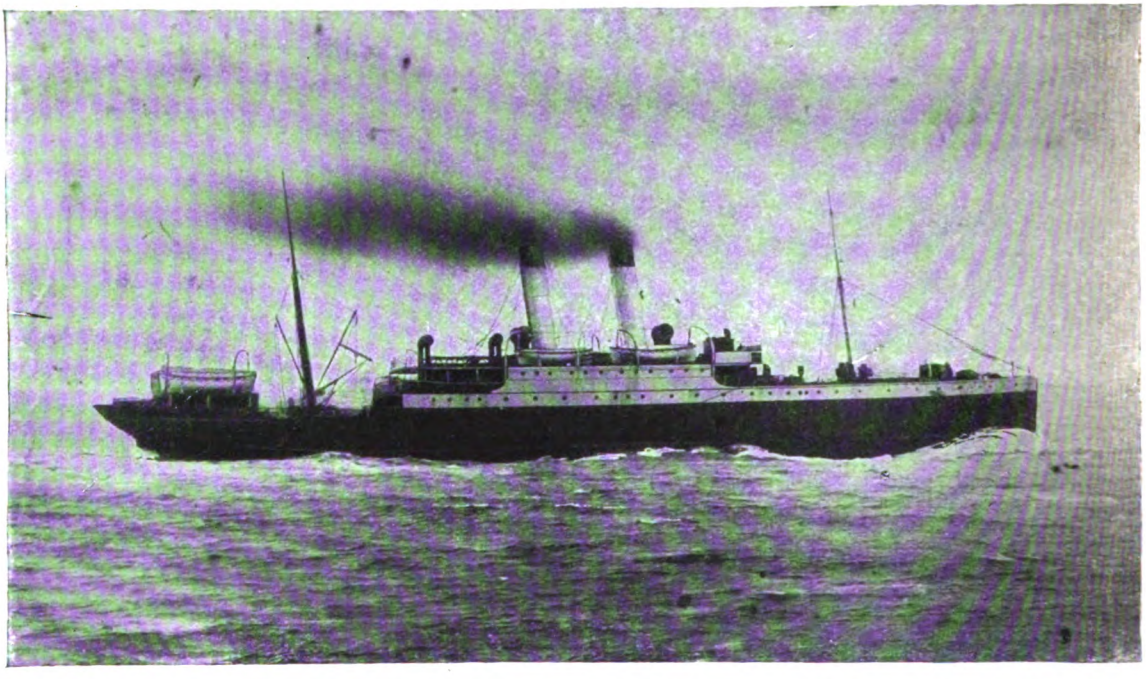
to connect with the train off the Rosslare night steamer leaving Fishguard at 3.25 a.m. due at Paddington at 9.5 a.m. The Cork steamer sails from Fishguard Harbour on Tuesday, Thursday, and Saturday nights, and leaves Cork for Fishguard at 7 p.m. on Mondays, Wednesdays, and Fridays. Passengers for the Cork boat travel by the same service as those for the Waterford boat namely 4.30 p.m. from Paddington. The boat sails from Fishguard at 11.25 p.m., and should arrive alongside the quay in Cork at 9 a.m. From Ireland the steamer connects with a boat express leaving Fishguard Harbour at 6 a.m. on Tuesdays, Thursdays, and Saturdays, and timed to reach Paddington at 12.40 p.m. The sea passages by each route are as follows:



CITY OF CORK STEAM PACKET CO.'S S.S. "INNISCARRA," 1412 TONS: FISHGUARD—CORK SERVICE.

			Nautical miles	Hours
Fishguard	Harbour	to Rosslare	54	2¾
,,	,,	,, Waterford	92	8¼
,,	,,	,, Cork	140	10

It is obvious at a glance that the Rosslare route, with its two services each week day, is the route for the man in a hurry, as well as for those who would avoid a night journey, and for those who desire to spend as little time as possible on the sea. Every convenience and luxury that modern shipbuilding and train construction can supply is at the disposal of passengers by the Rosslare route. The boat trains between London and Fishguard are equipped with Restaurant cars and the night train has also a sleeping car attached. The boat trains in connection with the steamers between Rosslare and Cork are also provided with breakfast and dining cars. The connections between the steamers and the boat trains are guaranteed, and the service has an excellent reputation for punctuality. The four turbine steamers sailing between Fishguard and Rosslare were built specially for the service. They are triple-screw vessels of 2,500 tons, capable of steaming 22½ knots per hour, performing the crossing in 2¾ hours.

To the Rosslare route first place is due because of its speedy service and its short-sea daylight passage. In most cases, probably the considerable majority, these factors are of a determining character, but it must not be overlooked that there are some travellers who find it more convenient to start their journey in the evening, and who are not at all averse to a longer trip on the sea than is made by the Rosslare boats. To go further, it may be assumed that in

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addition to those to whom the channel crossing is an attraction, there are others who, while not particularly pleased at the prospect of a long sea trip, have strong objections to turning out of the train in the "small hours" of the morning to go on board the steamer, and leaving the boat for the train on the other side of the channel with an interval of only a couple of hours on board, insufficient to make turning into bed worth while, although in order to meet the convenience of passengers it is permissible to go on board the night Rosslare boat several hours before the departure time and to remain there in the morning up to 8 o'clock. To these are offered the alternative services by the Waterford and Cork boats.

Prior to the inauguration of the short sea Fishguard–Rosslare route the Great Western Railway Company's route to Ireland lay by way of Milford and Waterford, the distance by sea between these ports being 98 knots. The vessels travelled by night, the service being somewhat the same as that now given by the Waterford boat. When the company abandoned Milford, and made Fishguard Harbour their port for Ireland, the service to and from Waterford was maintained, but the passenger traffic was almost wholly transferred to the new route, the vessels sailing to and from Waterford being concerned chiefly in the transport of merchandise and live stock. Because of this it must not be thought that the Waterford boats are of the nature of "tramps." On the contrary, these vessels—twin-screw steamers of 1,400 tons—are in every way comfortable. Lighted by electricity and well furnished, they can be recommended to travellers who must needs make the crossing at night, and prefer the longer sea route as giving an opportunity for a good night's rest on board. The boats berth at Adelphi Wharf, Waterford, which is only a few minutes walk from the principal hotels, and visitors to Ireland by this route have a charming first glimpse of the Emerald Isle when steaming up the estuary of the river Suir to Waterford City.

In considering the third of the Fishguard routes to Ireland the time-tables show that points enumerated as likely to tell in favour of the Waterford steamer count also to the Cork route, although the drawback of there not being daily sailings is a misfortune in the eyes of the tourist to whom a single day is precious. When holiday-making speed in travelling is not everything, and many travellers on pleasure bent, when undertaking a long journey including a cross-channel sea trip, will gladly sacrifice the extra time occupied on the journey for the compensating gain in comfort. This the journey by the Cork boat amply provides, with the added pleasure of sailing into the magnificent Cork Harbour in the early morning. The British Isles provide nothing finer, and surely but little to equal the splendid scene obtained from the deck of the steamer while it proceeds up the Harbour to the quay at Cork. Ships of war are to be seen, and if luck favours the voyager he may meet one of the large Cunard liners —perhaps catch sight of the giant *Lusitania* or *Mauretania*, which call at Queenstown when outward bound. If the weather be fair, the Cathedral of Queenstown will be seen glistening in the sun like sparkling crystal, while the white villas that dot the Queenstown side of the harbour in the midst of luxuriant foliage, and the white fairy-like villages of Monkstown, Glenbrook and Passage on the south shore go to make a beautiful *tout ensemble* hard to match anywhere.

The Cork boat is a favourite with old travellers from the South of Ireland to England, many of them not having yet tried the Rosslare route. It is probable that many of these, whose habits are stable and affections tenacious, will not be tempted from the Cork trip, except an unforseen emergency arise, leaving no option but for the crossing to be made by the fast route.

The s.s. *Inniscarra* which sails between Fishguard and Cork is a twin-screw steamer of 1,412 tons owned by the City of Cork Steam Packet Company, which has a long and honourable history. To this Company, under its old name of the "St. George Company" belongs the credit of having sent the first steamer to America, the s.s. *Sirius*. The Company is large and prosperous, owning vessels sailing from Cork to Liverpool, Bristol, Plymouth, Southampton, London, Newport and Cardiff in addition to Fishguard.

To summarise the merits of the Fishguard routes, the conclusions which most readily come to mind regarding the Rosslare service are speed and frequency of service, daylight short-sea crossing: the Waterford route allows of a full night's rest with a daily service but is slower. The Cork boat is for leisurely travellers who do not want to upset their ordinary hours of repose and is the picturesque route, suiting those who are not obliged to have a daily service.

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While on the subject of communications between England and Ireland it is interesting to see what sort of a journey our immediate forbears had. An extract from the time-tables of 50 years ago is here reproduced: of fast steamers that has facilitated so greatly the journey between England and Ireland. To such as may be concerned in the progress of the stages that mark the evolution in the modes of travel since the

TIME TABLE, *viâ* MILFORD HAVEN.
JANUARY, 1861.

FROM LONDON.			FROM IRELAND.		
	3rd. cl.	Expr.			
LEAVE	A. M.	A. M.	LEAVE	A. M.	A. M.
London at.....	6 0	9 15	Kilkenny at.....	—	11 45
Gloucester.....	11 10	12 50	Limerick.....	11 0	—
Newport.....	1 0	2 10	Killarney	8 46	—
Cardiff	1 25	2 26	Cork.....	10 10	—
Swansea	3 35	3 35	Mallow	10 57	—
	P. M.	P. M.	Limerick Junction.	12 24	—
New Milford (*arr.*)..	7 0	6 15	Tipperary.....	12 35	—
			Caher.....	1 5	—
Dep. by Boat....	7 30	7 30	Clonmel.....	1 32	—
Waterford (*arr.*)....	5 30	5 30	Waterford (*arr.*)...	2 35	1 20
Waterford (*dep.*) ..	6 0	12 0	Do. (*dep. by Boat*)	3 0	3 0
Clonmel.....	7 15	—		A. M.	
Caher.....	7 45	—	New Milford (*arr.*)..	2 0	2 0
Tipperary.....	8 15	—		Express 1 & 2 Class	3rd Class
Limerick Junction..	8 35	—	New Milford (*dep.*).	8 15	8 15
Mallow	1 10	—	Swansea	11 13	11 18
Killarney	8 55	—	Cardiff.....	12 49	1 17
Cork.....	2 0	—	Newport	1 20	1 59
Limerick (*arrival*) ..	9 45	—	Gloucester.....	2 45	3 55
Kilkenny.....	—	1 30	London (*arrival*) ..	6 0	8 50

The enterprise of British railways is a legitimate source of pride, and of the many notable ventures of recent years the construction of Fishguard Harbour is among the best. It is the enterprise of the Great Western Company in carrying through such a big and onerous work as the making of this Welsh port and in building of a fleet advent of the railway, a comparison of the time-tables of 50 years ago relating to the journey between England and Ireland with the time-tables of to-day may induce speculation as to whether we have yet reached the final stage. If not, as most may think what will the next decade or two bring forth?

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The Railways of Argentina. [Concluding.]

REMARKABLE RECORD OF BRITISH ENTERPRISE.

[From the Report of Mr. H. G. MACKIE, H.M.'s Consul at Buenos Ayres.]

Central Cordoba Railway.

At La Madrid station the North Western Argentine Extension of the Central Cordoba Railway connects with the Central Northern Section and runs along the foot of the sierras, connecting in its course up to Tucuman (90 miles) 14 sugar mills situated in this region, amongst which may be mentioned Santa Anna, Trinidad, La Corona and San Pablo, as being the most important in the country. The traffic on this line consists chiefly of the transport of sugar cane, sugar, alcohol, fruits, timber, rice, hides, etc. In addition to the line running from La Madrid to Tucuman there are branches as follows :—

	Miles.
Villa Alberdi to La Cocha	13½
Aguilares to Los Sarmientos ..	5
Concepcion to Medinas	7
Kilometre 136 to Muñecas ..	10

This line connects with the Central Northern Section at La Madrid and at Tucuman, and with the Central Northern Railway (State line) at Tucuman. The Cordoba and Rosario Railway runs from San Francisco to Rosario (138 miles) and San Francisco to Rafaela (53½ miles). It connects with the Eastern Section and Santa Fé Railway at San Francisco, with the Central Argentine Railway (broad gauge); in the port of Rosario with the Santa Fé Railway at Graneros Junction and with the Cordoba Central Extension to Buenos Ayres at Rosario. The traffic it handles consists chiefly of cereals and freight in transit from the North Central and Eastern Sections to the extension to Buenos Ayres of the Central Cordoba Railway and *vice versa*. The junction of the Rafaela Steam Tramway is at kilometre 217 on the Cordoba and Rosario Railway, and it extends up to Rafaela (34½ miles) and from Coronel Fraga to Pueblo Marini (10 miles). It connects at Rafaela with the Santa Fé Railway. Its traffic consists chiefly of cereals.

The Cordoba Central Buenos Ayres Extension line (186 miles) was temporarily opened for freight traffic in May, 1909, and definitely available both for passenger and freight traffic in May, 1912, the new terminal station and the works on the site reclaimed from the river being virtually completed. Passengers are now able to travel by the Cordoba Central System from the distant regions covered by the extensive lines of the company to Buenos Ayres with all possible comfort. The splendid and luxurious saloon, sleeping and restaurant cars are attended by a competent staff, and the catering is under the direct supervision of the company. The reclaimed land adjoining the docks will tend to beautify the city. On it the municipality proposes to lay out extensive public gardens and a large boulevard, 55 yards wide, facing the river Plate, for a distance of nearly 7 miles.

Such is, in general lines, the work accomplished by the enterprise of the railway company in question. The line starts from the metropolis, passes through the province of Buenos Ayres, Santa Fé, Cordoba, Catamarca, Santiago del Estero and Tucuman, at which latter point, as already mentioned, it connects with the State railways having a similar gauge (1 metre), and continues up to the frontier of Bolivia at La Quiaca. The companies mentioned proposed to the National Executive Power that the tariffs formerly in force should be substituted for a system called " Tarifas Parabolicas " (parabolic tariffs), which would enable them to charge equal rates between rival points and at the same time maintain their traffic on all their sections by adopting only one direct tariff between any two stations on the line, as if dealing solely with one company. These companies work under one management and form the system known as the Cordoba Central Railway, the rolling stock of which is as follows :—

	Number.
Locomotives	220
Passenger coaches	240
Vans for passenger trains	75
,, freight trains	80
Freight wagons	5,400

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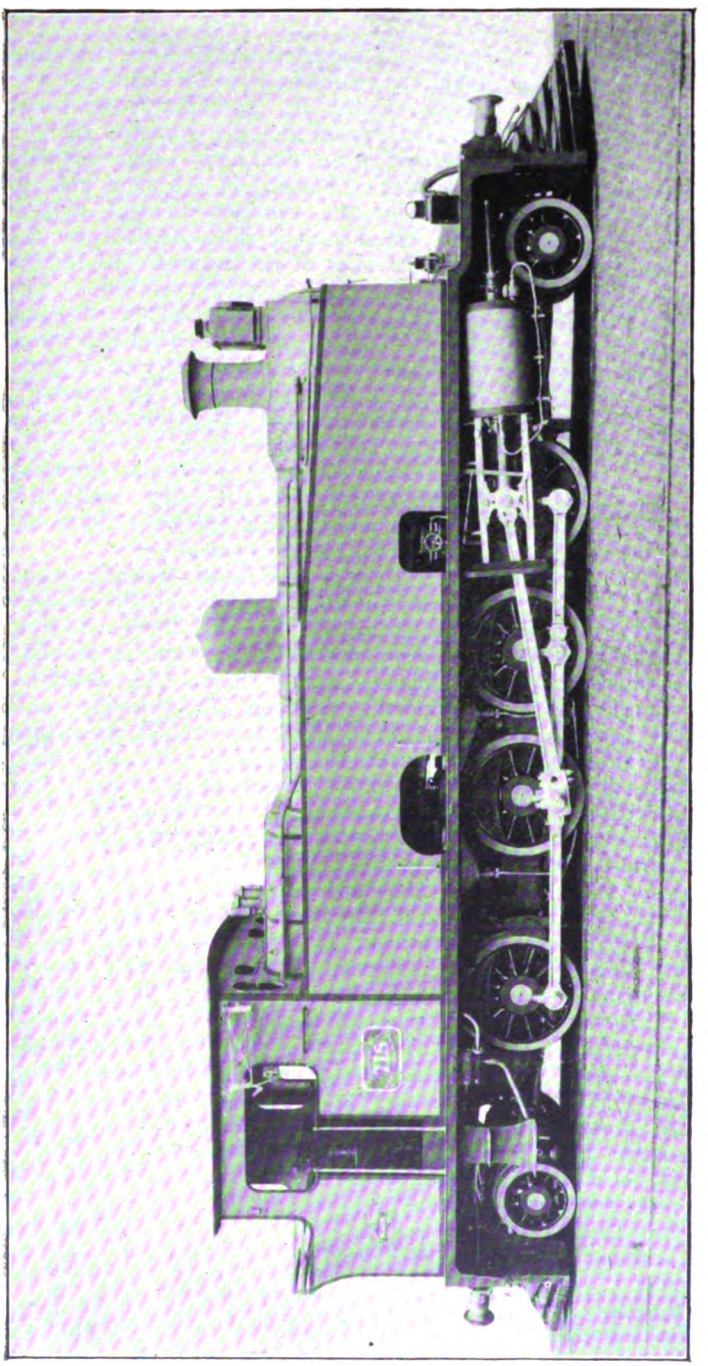
Pacific Railway.

The Buenos Ayres and Pacific Railway Company was formed in London in 1882 to take up the concession for building a railway in Argentina to remain the property of the company in perpetuity. The parent line runs from Buenos Ayres to Villa Mercedes, a distance of 425 miles, but since 1900 a number of extensions and branch lines have been built, and several valuable properties have been acquired by the company. Westwards the system now extends through the fertile province of Mendoza, the company having acquired the administration of the Argentine Great Western Railway. In 1909 the Pacific and Central Argentine Railways bought up the Trans-Andine Railway from the Government, the former taking over that portion embraced between Villa Mercedes, Villa Dolores and Rio Cuarto. These lines, in conjunction with the Chilian railways, give a route from Buenos Ayres to Valparaiso and Santiago.



BUENOS AIRES AND PACIFIC RAILWAY:
2-8-2 Type Tank Engine fitted with "Robinson" Superheater.

By acquiring the control over the Bahia Blanca and North Western Railway Company the Pacific system now extends over the south west districts of the province of Buenos Ayres. Its terminus at Bahia Blanca is provided with a port having a low water draught

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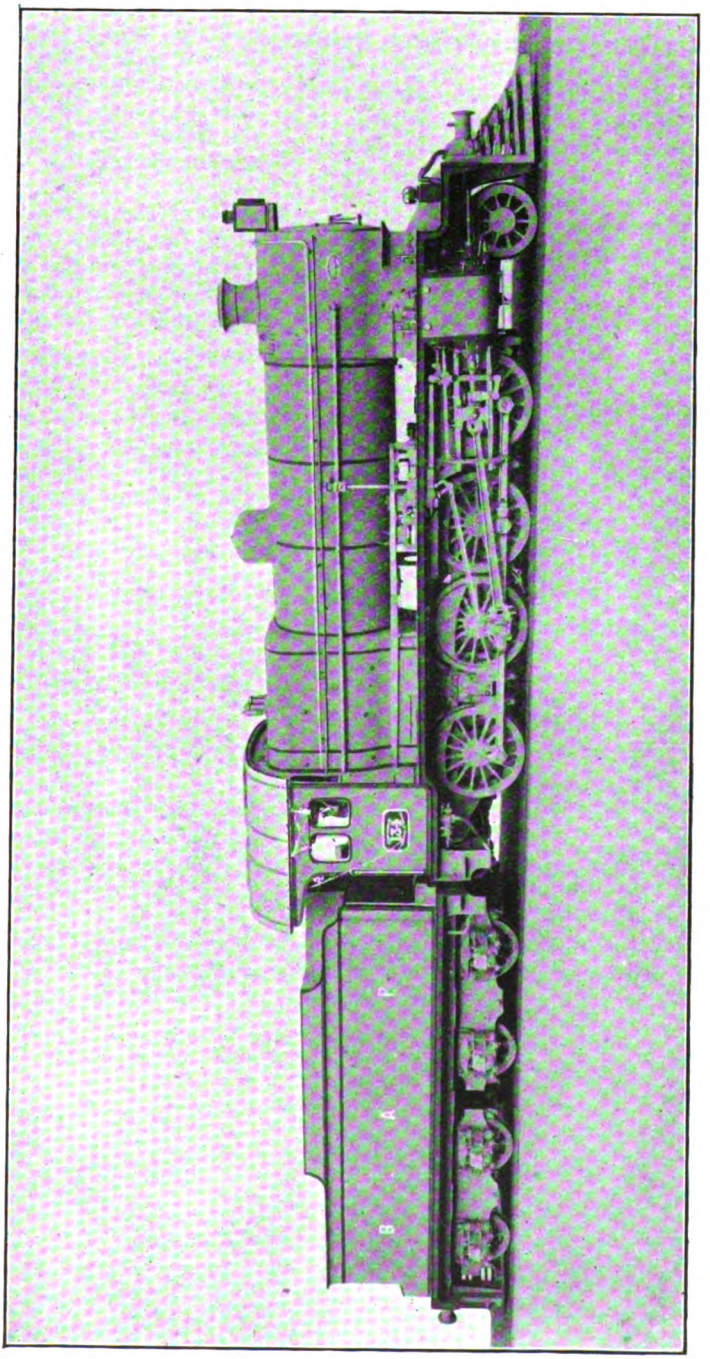
of 25 ft. and accommodation for 14 vessels. There are two substantial grain elevators now in use and a third of larger dimensions is in course of construction on reclaimed ground provided on the landward ends of the moles. The new elevator, equipped with the latest devices for handling grain, will be driven by electric power and will have a central tower six stories high. Electric lifts, automatic weighing machines and mixing appliances, elevated platforms fitted with electric belts, etc., are being provided for the rapid despatch of grain cargoes. A new mill has just been erected close to the elevators, fitted with up-to-date milling plant. Electric cranes, fitted with portable elevators, are provided to each ship.

Vessels lie alongside quays of solid masonry and are served by a railway having 30 sidings worked by electric capstans by means of which vessels can also enter and leave the port without the aid of tugs. The large Victoria produce market at Bahia Blanca is likewise the property of the company. The total length of track under the company's control is 3,348 miles, of which 87 are double track; the gauge is 5 ft. 6 in. and the weight of the rails on the main line 100 lbs. per yard, reduced to 70 lbs. on the branch lines and sidings. On June 30, 1911, the rolling stock consisted of :—



BUENOS AIRES AND PACIFIC RAILWAY:
2–8–0 Type Goods Engine fitted with "Robinson" Superheater.

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	Number.
Locomotives	679
Passenger cars	388
Vans	447
Wagons	23,142

Western Railway.

The Buenos Ayres and Western Railway is the oldest in Argentina, dating back to 1857. This line originates at Buenos Ayres and has a system covering 1,586 miles of track, its principal termini being Bagual, Victoria, Toay and Carhue. As regards railway extension, satisfactory progress marked the year 1911, during which 221 miles were opened to traffic. The further extensions under construction, and which will probably be completed within the current year, are :—

	Miles.
Bagual to Rio Salado	53
Rio Salado to Colonia Alvear ..	69
La Zanja to Gonzalez Moreno ..	45

From the latter line it is proposed to build a line to run in a south-westerly direction, about midway between the lines to Toay and Telen, covering a distance of 94 miles, through the extensive undeveloped district lying between the two lines. An expert report upon the proposed electrification of the suburban service of the line is under consideration. The rolling stock consists of :—

	Number.
Locomotives	293
Carriages (124 first class and 66 second class)	190
Sleeping cars	37
Composite saloons	7
Dining saloons	16
Brake vans	54
Goods wagons	6,611
Various service vehicles ..	2,391

Government Railways.

The avowed object of the Government railways is to open up districts undeveloped by private railway enterprise—districts, in fact, that are too far removed from the sea to admit of profitable development, or where the population is sparse and local conditions unattractive. The State railways are consequently to be found in some of the most backward parts of Argentina in which it is desired to spread civilisation and encourage colonisation. The Government railways in the north of the Republic are now being used as mediums for reaching beyond the limits of unproductive territory. This is being effected by carrying over the State system railway extensions that are now penetrating into some of the neighbouring Republics. State constructed railways are to be found in the provinces of Jujuy, Salta, Catamarca, La Rioja, Tucuman, Santiago del Estero, San Juan, Cordoba and Santa Fé. The system covers 3,330 miles of railway.

Farquahar Railway Syndicate.

A railway syndicate, known as the Farquahar group of capitalists, are in treaty with the Government for the purchase of the State-owned Central Northern and Northern Argentine lines. The former system has a length of 1,422 miles and the latter 1,380 miles. The figure mentioned as the purchase price appears to be £2,727,000, the proposed transfer carrying with it an undertaking to convert these systems into broad gauge lines within a period of 10 years. The sphere of activity of the syndicate at present extends over the provinces of Entre Rios, Corrientes, Santa Fé and the Chaco, which is believed to be a region capable of further development in railway enterprise. This syndicate is registered in the United States as the Argentine Railway Company. The company appears to have been promoted in London, New York, Paris and Belgium, and its board is composed of members representing the markets in which the capital was raised.

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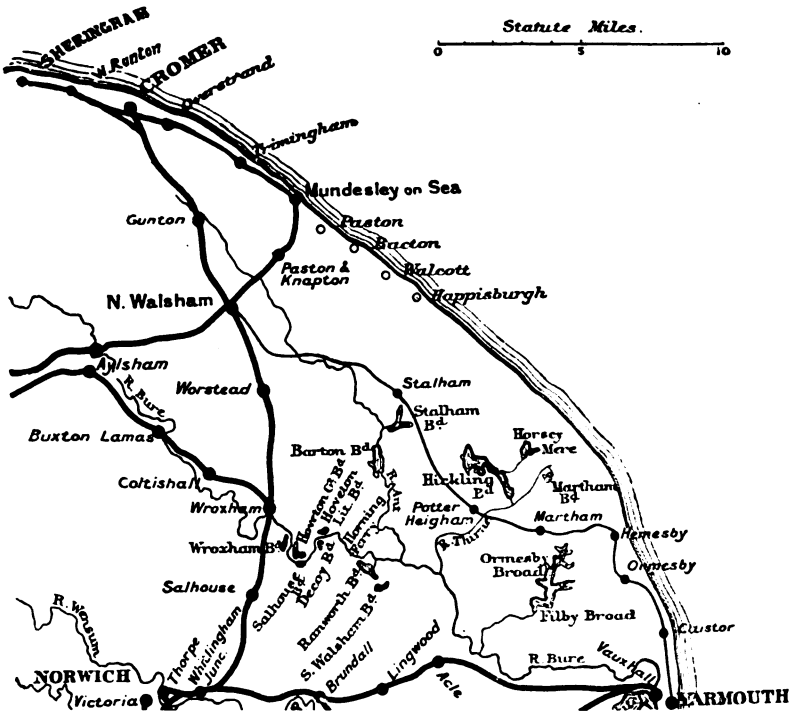

Holidays on the Great Eastern Railway:

TO THE NORFOLK BROADS AND CROMER.

IT is surprising that such a comparatively small number of people take holidays in the Spring, and still more astonishing that so few are aware of the wonderfully invigorating virtues of the East Coast at that period of the year. Nature may then be seen at her best. The days are long, very often cloudless, and still more frequently dry; trains are far from being overcrowded, reasonable prices rule in all establishments wherein accommodation is provided for visitors, and there is by road and river alike a freedom of locomotion which begins to diminish in July, and in some places almost wholly disappears in August. But with these and other advantages in favour of May and June, the vast majority of men and women still persist in choosing the hottest days of summer for their holidays. When an explanation is sought, we are told that the arrangement is dictated by old fixtures in relation to the public school holidays! If this really be the fact, one can only say, "So much the worse for public school holidays and for all whom they affect." But the time may come when a better and a more rational order of things may prevail.

At present, however, the foolish boycott of glorious May is so severely practised on the East Coast that when, at the invitation of the Great Eastern Railway Company, a party of journalists arrived in Cromer on Friday, the 23rd of that month, in the present year, they saw that the Links Hotel—a palatial establishment occupying a splendid position on the cliffs that overlook the meadows of "Poppyland"—had not yet been "opened for the season." There was a cinematograph party preparing for the

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production of pictures depicting scenes in a well-known novel; but visitors on pleasure bent were everywhere conspicuous by their absence. The crowds were apparently waiting for later months, thereby losing the charm of East Anglia in the long and lovely days of spring. In Sheringham Park —which Mr. Upcher has now generously opened to the public on Sunday, as well as week-day—the tall rhododendrons of many hues had unfolded blooms of indescribable beauty, blending harmoniously here and there with great banks of honeysuckle; red and white hawthorn was seen under the green leafage of road side and garden; the laburnum was still hanging down its bright yellow petals; hyacinth, primrose and red campion were nestling upon the hedgerows; and pending the outburst of the red poppy, the golden gorse completed the display of colour that Nature never makes so bountifully as in the balmy days of spring. With a view to break down, if possible, some of the barriers which now confine the holiday season to a period of less than three months, Mr. Walter Hyde, the General Manager of the Great Eastern Railway Company, will again start the accelerated summer train services on the 1st July, instead of the 14th or 15th, and the time may not be distant when the same excellent facilities will be inaugurated even sooner.

To the Norfolk Broads and to Cromer the route from Liverpool Street is, of course, the shortest, the quickest and most direct. The extensive restaurant car stock possessed by the company enables luncheon, tea or dinner to be enjoyed in one direction, while breakfast, luncheon, tea or dinner may be had in the other, according to the time of departure for London. Our frontispiece of famous trains, published in this issue of the RAILWAY MAGAZINE, shows one of the popular Norfolk Coast Expresses, which figure in the daily schedule from 1st July. These trains consist of the finest corridor coaches, and include restaurant car accommodation sufficient to allow 150 passengers to lunch or dine at the same time. The catering —undertaken by the company and superintended by Mr. H. C. Amendt, the manager of the Great Eastern hotels—gives universal satisfaction, and always adds to the pleasures of the journey. In addition to the tourist, fortnightly, week-end, and excursion tickets issued from Liverpool Street, travellers have the advantage in summer of a fast service linking the West and the East Coast. This service, performed by buffet-car expresses, is every week-day, commencing in mid-July, between Manchester, Liverpool, Warrington, Stockport, Sheffield, Worksop, and Lincoln, Yarmouth, and Lowestoft. Tickets for varying periods are issued at low fares.

This season several improvements have been made in the train services between London and Sheringham. The 4.55 p.m. from Liverpool Street, which during April, May and June previously ran on Friday only, conveys passengers for Sheringham every week-day; and instead of beginning in July, as in previous years, the 5.42 p.m. Sunday train from Cromer, which leaves Wroxham at 6.11 p.m., due to arrive in Liverpool Street at 9.10 p.m., has since the beginning of April been running on Sundays. In one of his delightful booklets, Mr. Percy Lindley has reminded the public that the holiday attractions of the Norfolk and Suffolk Coast do not end with the sea. For to the sea there is the background of the Broads—the inland lakes and rivers which form a combination literally without parallel in any other part of Great Britain. Lowestoft and Yarmouth are capital headquarters for this land of lakes and rivers, while Wroxham—at the very heart of the Broads, and only a few stations away from Cromer —is exactly 15 minutes by train from Norwich, and has the advantage of rail connection with Sheringham on one side, and with Mundesley on the other. Access to this bracing holiday region has, therefore, been rendered particularly easy not merely from

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Photo] [*Photochrom Co., Ltd.*

WHERRY LEAVING WROXHAM.

London, but from many other parts of the country.

As a boating and yachting rendezvous, the Broads exercise a fascination greater perhaps than that attaching to any home waterway navigated in the ordinary pursuits of trade. The Norfolk wherry here reigns supreme, and, strange to relate, has no exact imitator elsewhere. "For a sculling or fishing trip," says Mr. Lindley, "no one packs a better lunch-basket than your buxom landlady of the Broads. And nowhere is the old-fashioned, homely welcome of the inn more hearty than on the rivers of Norfolk and Suffolk. Living afloat, if you make up a party for a holiday cruise, is cheaper still. Assuming that one must live all the time, somewhere, then living on a Norfolk wherry costs no more, probably much less, than at home. A large wherry to take a party of eight costs, say, from £10 a week, including the crew, from skipper to cook. The party does its own catering. Hire of the wherry and the catering practically cover all costs. Smaller craft can be hired to suit parties of all sizes and practically all purses. One need not be a sailor bold, or know the difference between heaving a sigh and an anchor to cruise on the Broads. The crew is provided with the craft, and everything is found down—on larger wherries—to the piano. In a word, it is probably well within truth to say that the Broads give as much for your money in the way of restful change and a simple, healthful holiday as you can get anywhere." There are three main rivers—the Bure, the Yare, and the Waveney, which afford 200 miles of the best smooth sailing water in England.

It was from Wroxham that the guests of the Great Eastern Railway Company went in the capital motor launches of Messrs. J. Loynes & Son, yacht builders and owners, to Coltishall, through Wroxham Broad, and thence to Horning Ferry, returning to Wroxham. It was a delightful trip, long enough to enable any who were strangers to get a glimpse of the real pleasure which a holiday on the Broads promises to all who are fond of boating. At one time oar and sail were the only means of propulsion employed, but there are now large numbers of launches—all electric, perhaps, save one or two—and craft of this kind are particularly useful to those who are unable to remain in the neighbourhood more than a few days. The little village of Wroxham is now a scene of bustling activity. Yacht, motor launch, and boat building has become its chief industry, and there are signs of prosperity on every hand. Chalets have steadily increased

Photo] [*Photochrom Co., Ltd.*

BRIDGE AT WROXHAM:

Messrs. J. Loynes & Son's boathouses, yachts, electric launches, and other craft.

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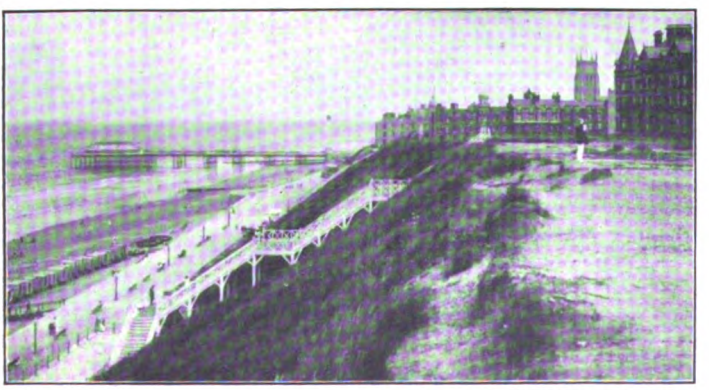
in number, and the majority are dainty little structures, fronting well-trimmed lawns, offering ideal accommodation to those who find genuine pleasure and relaxation on the Broads. In most places the houses are built over narrow backwaters, the living rooms being above the boat shed, where they are free from damp. Formerly fishing was free, but under the Norfolk Fisheries Provisional Order Confirmation Act, 1912, a licence is required by persons fishing in the rivers and Broads of Norfolk and Suffolk. Golf must be mentioned as another outdoor sport which has obtained a strong hold in East Anglia. There are capital links at Cromer—recently extended by 600 yards—at West Runton, Sheringham, and at more than a score other places on the coast or inland. All are being well patronised, and the Great Eastern Railway are doing everything that is possible to encourage the game. No fewer than 67 trains run daily from Liverpool Street station to the 19 seaside resorts served by the company, and to all golfers have the advantage of cheap fares by the fastest expresses.

At Cromer the press visitors were provided with rooms at the Hotel de Paris, and at dinner on Friday, May 23, when Mr. Walter H. Hyde presided, the company included Mr. F. G. Randall, Superintendent of the Line; Mr. C. Busk, Continental Manager; Mr. P. Lomas, Secretary; Mr. W. C. May, Goods Manager; Mr. H. C. Amendt, Hotels Manager; Mr. A. J. Hill, Locomotive Superintendent; Mr. H. Jones, Chief Engineer; Mr. R. B. Ellis, Assistant Superintendent of the Line; Mr. H. J. Prytherch, Indoor Assistant to Superintendent of the Line; Mr. G. Jessup, District Superintendent, Norwich; Mr. A. P. Parker, General Manager's Department, Editor of the *Great Eastern Railway Magazine;* Mr. E. A. Evans, Manager of the Publicity Department; Mr. Batchelor, Hotels Department; Mr. H. M. Snow, International Sleeping Car Company; Mr. F. M. Lambert, Photochrom Company; Mr. J. A. Kay, Editor, *Railway Gazette;* Mr. W. T. Perkins, Editor, RAILWAY MAGAZINE; Mr. Bune, *Times;* Mr. Bromley Read, *Morning Post;* Mr. J. Callingham, *Morning Advertiser;* Mr. C. Davies, *The People;* and many other representatives of London and provincial journals.

Photo] [*Photochrom Co., Ltd.*

SHERINGHAM.

At table the guests were handed boxes containing an excellent selection of coloured pictorial cards, which were presented with the compliments of the Great Eastern Railway Company as a *souvenir* of a most enjoyable and admirably managed trip. The cards, specially prepared for the occasion by the Photochrom Company, Limited, in the "Celesque" Series, faithfully illustrate some of the most beautiful scenes on the Norfolk Broads and in Cromer or its neighbourhood, and we are indebted to Mr. Lambert, the Managing Director of the Photochrom Company, for permission to reproduce some of these excellent prints.



Photo] [*Photochrom Co., Ltd.*

CROMER.

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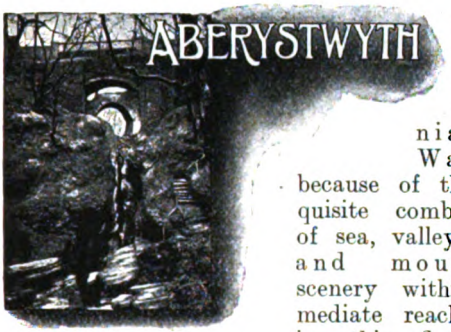
The Call of the Cambrian Coast.



DEVIL'S BRIDGE.

has been called a "Miniature Wales," because of the exquisite combination of sea, valley, river and mountain scenery within immediate reach, and in this flourishing resort the Cambrian Railways undoubtedly possess a holiday haunt of which less favoured lines may well be envious. It is, indeed, doubtful whether there is any part of the British Coast where a hundred miles can be found presenting such charming variety as that on the western seaboard of Wales stretching from Aberystwyth to Pwllheli, first northward and then westward along the shores of Cardigan Bay. The "Call of the Cambrian Coast" is as insistent as it is eloquent, and there are numbers of visitors who renew acquaintance year by year with Aberdovey, Towyn, Barmouth, Harlech, Portmadoc, Criccieth, or other famous spots overlooking the famous bay. Of these the Photochrom Company, Ltd., have a splendid collection of photographs from which a selection has been made to illustrate this article.

To Londoners frequenting the Euston terminus, London and North Western Railway, the green coaches of the Cambrian Railways, are quite familiar, and, as reference to the public time tables will show, there is a good service of through carriages between the Metropolis and the Cambrian Coast. These vehicles are, as a rule, of corridor, lavatory, vestibuled, bogie composite design, so that all the conveniences of modern travel are afforded, including access to the dining cars on the trains to which the Cambrian stock is attached. Although it is usual to regard the London

ABERDOVEY.

and North Western Railway as the closest ally of the Cambrian Railways, the relations of the latter with the Great Western Company are intimate, and through carriages to the Welsh seaboard of the Cambrian system are found on some of the services from Paddington.

The General Manager of the Cambrian Railways, who is showing enterprise in advertising the holiday territory served by that railway, has recently issued a poster 80 ft. by 60 ft., exhibiting in panoramic form the principal towns on the shores of Cardigan

ABERYSTWYTH.

BARMOUTH BRIDGE.

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Bay, the poster being the largest which the Cambrian Company has ever produced. Excellent facilities are provided for local travel, and, as RAILWAY MAGAZINE readers are notoriously those who prefer the "iron road" to the "dusty highway," they will not fail to appreciate the holiday contract tickets, which, at exceptionally low fares, enable the holders to become familiar with the whole Cardigan Bay district. For day trips cheap tickets are also issued between principal stations. Full particulars may be obtained from the Company's headquarters in Oswestry, and travellers are recommended to apply well in advance of their intended visits to Wales, so that the itineraries of their local rail journeys may be mapped out beforehand.

None interested in miniature railways will fail to traverse the Vale of Rheidol Railway from Aberyswyth to Devil's Bridge. This line was fully described in the RAILWAY MAGAZINE, as recently as October, 1910, and it has since attracted greater attention than ever. Our readers will also find much to their mind at Portmadoc, which is the starting point for the Snowdonian tours.

HARLECH CASTLE.

Many thousands of tons of slates are annually shipped from this little port to all parts of the world, the slates being loaded in small trucks at Blaenau Festiniog, and sent down to Portmadoc by the Festiniog Railway. All who contemplate a journey into "Winsome Wales," or desire to know more of the delights of the Cambrian Coast are invited to communicate with Mr. S. Williamson, General Manager, Cambrian Railways, Oswestry, who will immediately supply gratuitous holiday literature relating to the district covered by the lines.

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The London and North Western Railway:

Appointment of Mr. Guy Calthrop.

CHANGES which have occurred in recent years compel the directors of the London and North Western Railway to depart from a well-established practice in regard to the office of General Manager. Instead of selecting one of their present officers to succeed Sir Frank Ree, who will retire next year, they have invited a former official to return to the Company; but, as the choice has fallen upon Mr. Guy Calthrop, no surprise whatever is felt at the decision. Although a young man, Mr. Calthrop has had a remarkable railway career. Born in 1872, at Uppingham, he will, we believe, rank not only as the junior among the general managers of leading British railways, but as the youngest who has ever exercised authority at Euston. The directors were, however, so anxious to secure his services that they begged the Buenos Ayres and Pacific Company to release him from the engagement into which he entered to serve as their General Manager for a period of five years. A nephew of Lord Alverstone, the Lord Chief Justice, Mr. Calthrop began his experience on the London and North Western Railway in 1886, as a junior on the staff of the Superintendent of the Line under the late Mr. E. M. G. Eddy, and in 1892 became outdoor assistant to that gentleman's successor, Mr. G. P. Neele. Two years later he was appointed Superintendent at Crewe Junction and Works, and in 1895 promoted chief outdoor assistant to Mr. Robert Turnbull—the new Knight among railway Superintendents. In 1901 Mr. Calthrop became assistant to Sir Frederic Harrison, then General Manager; but further advancement at Euston was soon afterwards arrested, for a time at least, by the invitation which came from the directors of the Caledonian Company. This placed Mr. Calthrop in the chair rendered vacant by the retirement of Mr. Kempt, the General Superintendent. The excellent work of the former in that position subsequently induced the Board to appoint him General Manager, and this office he was filling when the directors of the Buenos Ayres and Pacific Railway asked him to become General Manager of that line at a salary of £5,000 a year. Mr. Calthrop has, therefore, a very fine record, and we are convinced that in selecting him to succeed Sir Frank Ree the Board of the London and North Western Company have taken a step which will be attended with the happiest results to the Company.

Photo [*Elliott & Fry.*

MR. GUY CALTHROP,

Who will, in January next, succeed Sir Frank Ree as General Manager, London and North Western Railway.

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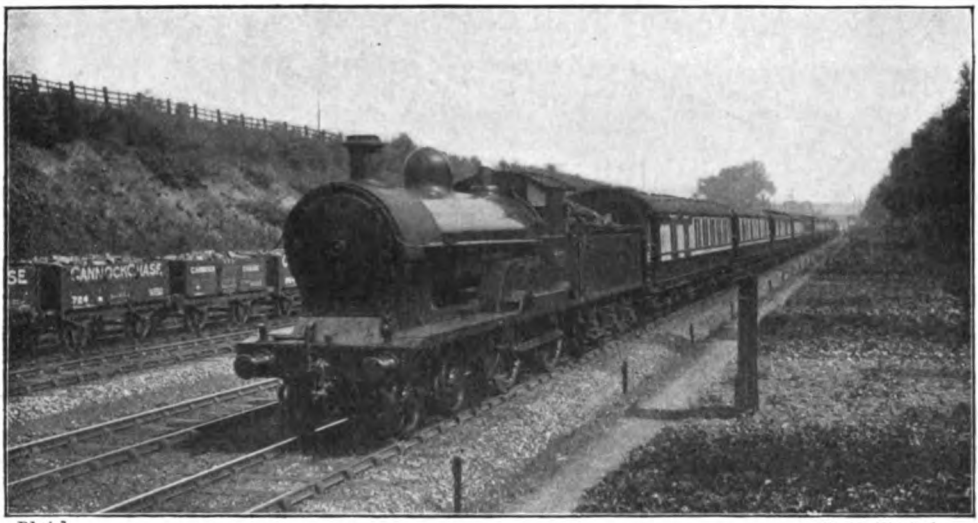

Photo] [*H. T. Worlock.*

LONDON AND NORTH WESTERN RAILWAY:

2 p.m. down Scotch express, 4–4–0 locomotive (Schmidt superheater) No. 1706 ***Elkhound.***

SUMMER TRAIN SERVICES.

IN accordance with custom, we now publish our annual review of the principal alterations and developments in train services, as shown in the summer time-tables of 1913, and desire to acknowledge the co-operation of the chief officers of the various railways in supplying the required information.

CALEDONIAN RAILWAY.

Most of the special residential trains which have formed so prominent a feature for several years past on the Caledonian Railway came into force on May 1, and on June 1 were supplemented by a number of excursion and tourist trains. The full summer time-table will apply from July 1 and will include a number of detail alterations and improvements as compared with last year's arrangements conducing to convenience of travel. Commencing July 1 many of the important main line trains will be run in duplicate. For instance, the popular 10 a.m. and 2 p.m. trains from Buchanan Street to Perth, Dundee and Aberdeen, will be divided. As in former years, the feature of the summer train arrangements is the excellent service provided for residential purposes. With regard to the Clyde coast services times have been adopted which are to become standard times, and in the case of the residential services the same times will apply all the year round. The Sunday train services constitute the only decided departure. The new arrangements apply both at Edinburgh and Glasgow. In the case of Edinburgh the new service is being run between Princes Street and Balerno, with an entension of the morning and evening train to West Calder. Five trains are run in each direction calling at intermediate stations. The first train leaves Princes Street at 12.35 p.m., running all the way to West Calder, then at 2.35, 4.35, and 6.35 to Balerno, and 8.5 p.m. to West Calder. In the Glasgow district considerable attention has been drawn to the company's action in introducing a Sunday service between Glasgow Central) and Whitecraigs station. The latter station is only three minutes walk from Rouken Glen, a large public park, with Mansion House, given to the city by Lord Rowallan. The Glasgow Corporation Tramway services cannot cope with the traffic, although running cars as closely as possible. The new Sunday service inaugurated by the Company to Whitecraigs will enable many people to visit this lovely spot, when otherwise they would have difficulty in doing so. The service began on the first Sunday in June, and 10 trains are being run in either direction, commencing at 1.30 p.m. from Glasgow and every half hour thereafter until 6 p.m., returning immediately from the Glen with the last train leaving at 8.45 p.m.

GREAT CENTRAL RAILWAY.

The Great Central summer time tables will operate on and from Monday, July 14. Among various improvements in train services, the following may be mentioned: A new through night service will be established between the West and North of England by the extension of the 7.50 p.m. train from Bristol to Leicester through to York. This train is to run *viâ* Sheffield, and be due to arrive in York at 2.43 a.m., connecting there with the East Coast express, due to leave at 3.12 a.m. for Newcastle, Edinburgh, and Aberdeen. The 9.55 p.m. train from York to Leicester will leave at 10 p.m. and run to Bristol, taking up the working

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from Leicester of the 12.50 a.m. train, which will leave at 1.5 a.m. This train will connect at Bristol with the early morning express trains to South Wales and the West of England. In view of the fact that the Great Central Company are already so largely concerned in cross-country through services, in many cases using special stock, including restaurant car facilities—Newcastle and Cardiff and Barry; Newcastle and Bournemouth, York and Southampton, Manchester and Halifax, and Bristol and Ilfracombe, Liverpool, Manchester and Sheffield and Yarmouth and Lowestoft, for example—these further connections will, we are sure, be cordially welcomed. Tourist centres on the Cambrian Railways are also being catered for by the running of a tourist express from Sheffield (Victoria) at 9.5 a.m., and Manchester (Central) at 10.50 a.m. for Aberystwyth and other Cambrian resorts. A new express will run from Sheffield to Grimsby and Cleethorpes, leaving at 8.53 a.m., and be in connection with the 7.40 a.m. breakfast car express from Manchester. A new express will leave Cleethorpes for Sheffield at 5. 10 p.m., and be in connection at Sheffield with the Hull to Manchester express, leaving at 7.55 p.m. A tourist express will leave Sheffield (Victoria) at 7.30 a.m. on Mondays, Tuesdays and Saturdays for Liverpool in connection with the steamers from Liverpool to Douglas, Llandudno, and other places. The return train leaves Liverpool (Central) at 8.33 p.m., after the arrival of the North Wales and Isle of Man steamers.

GREAT EASTERN RAILWAY.

Following the practice adopted last year, the Great Eastern summer time tables are brought into operation on July 1. Several alterations are made in the starting times of principal expresses in both directions, intermediate and destination times being, as a rule, advanced or retarded to correspond. In the down direction the "Norfolk Coast Express" for Cromer, Mundesley-on-Sea and Sheringham will leave Liverpool Street at 1 p.m. instead of 1.30 p.m.; the 12.35 and 12.40 p.m. expresses from Liverpool Street for Yarmouth and Lowestoft and Aldeburgh will start respectively at 12.25 and 12.30 p.m.; and the 12.56 p.m. (Saturdays only) express for Clacton-on-Sea, Frinton-on-Sea, and Walton-on-the-Naze, will leave at 12.40 p.m. As regards up trains, the 3.55 p.m. express from Cromer will start at 4.5 p.m., the 1.30 p.m. from Yarmouth at 1.35 p.m., the 1.50 p.m. from Lowestoft at 1.55 p.m., and the 2.25 p.m. from Felixstowe at 2.10 p.m. On Sundays an additional train will run from Southend-on-Sea to Liverpool Street at 9.12 a.m., calling at Prittlewell, Rochford, Rayleigh, Shenfield and Brentwood, arriving in Liverpool Street at 10.22 a.m.; with a return service from Liverpool Street to Southend-on-Sea at 10.10 p.m., calling at Brentwood, Shenfield, Rayleigh, Prittlewell, and arriving in Southend at 11.16 p.m. As in past years the main line service will be run to a large extent by the "Claud Hamilton" class of locomotives, but as a number of the new six-coupled engines of the 1500 class are available, they will be employed on various principal trains, particularly those which are always very heavy during the holiday months. The carriage stock has been augmented by 60 bogie composite coaches, including an additional dining car set of two vehicles, one first and one third. These carriages are all to standard designs, but in the case of the dining cars a trial is being made of the system of separate chairs instead of the original seating arrangement.

GREAT NORTHERN RAILWAY.

On the whole, the Great Northern Railway will adhere this summer to the comprehensive facilities provided last year, but several special items may be mentioned. A new express will leave Manchester (Central) each Saturday from July 12 to September 20, at 10.18 a.m. for Skegness, Lowestoft, and other stations, with a corresponding return train leaving Skegness at 3.20 p.m. and Lowestoft at 12.35 p.m. for Manchester (Central). A further development of the through carriage arrangements introduced last year in conjunction with the South Eastern and Chatham Railway is a new through service between King's Cross and Ramsgate, Broadstairs, and Margate, arriving King's Cross on the northward journey at 12.10 p.m., and leaving King's Cross for the Kent Coast at 2.55 p.m., connecting up in each direction with express trains to and from the North and Midlands. The 1.5 p.m. express from King's Cross to Scarboro' will convey a through carriage for Stockton and West Hartlepool. The through carriages between King's Cross and North Berwick and other improvements in the Scottish connections are referred to in the North British Railway section. The summer time table will be dated July 1 to September 30. The new line between Kirkstead and Little Steeping will be opened for traffic on July 1. This will considerably shorten the route to the Lincolnshire coast resorts from Lincoln and stations north thereof. A through service of eight passenger trains between Lincoln and Skegness will be given each week-day by this route, in addition to which two new through expresses will run between Sheffield and Skegness (*viâ* Lincoln): 8.35 a.m. from Sheffield, arriving Skegness 11.7 a.m.; 8 p.m. from Skegness, arriving Sheffield 10.30 p.m. (Bank Holidays excepted).

GREAT WESTERN RAILWAY.

On the Great Western Railway the summer time-tables will operate from July 12 to September 30. In addition to the summer expresses and augmented local services with which the travelling public have become familiar, there are many new features in the new tables which should appeal both to the business man and to those upon holiday bent. A new third-class only express which will be known as the "Devon and Cornwall Special" will run on Thursday, July 31, Friday, August 1, and every Saturday until September 20 inclusive (the days most favoured by holiday folk for starting their vacation). This train will leave Paddington at 9.30 a.m. and run non-stop to Newton Abbot, where it will detach a portion for Torquay and Paignton, reaching Torquay at 1.25 and Paignton at 1.35. Plymouth will be reached at 1.48 p.m., Tavistock at 3.5, Looe *viâ* Liskeard at 3.10, Fowey *viâ* Lostwithiel at 3.15, Newquay *viâ* Par at 4.12, and Falmouth at 4.5 p.m. A corresponding

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up train will run each Saturday during August and S ptember leaving Falmouth at 8.45 a.m., Newquay at 8.50, Fowey at 9.45, Looe at 9.55, Plymouth (North Road) at 11.15, Paignton at 11.17, Torquay at 11.27, and Newton Abbot at 12.15, running non-stop from there it will be due in Paddington at 3.43 p.m. The train will be vestibuled throughout, with carriages to and from Torquay and Paignton, Newquay and Falmouth. There will be a luncheon and tea car and a special feature will be the bicycle van. Passengers will be enabled to secure numbered seats in advance by forwarding the registration fee of 1s. per seat. The 6.15 p.m. fast train from Paddington to Oxford will be extended to Worcester and Malvern. The 7.53 p.m. train from Birmingham to Paddington will be run in duplicate, the second part starting from Birmingham at 8 p.m., calling at Leamington Spa at 8.29, and reaching Paddington at 10 p.m. On Sundays a further acceleration has been effected in the West of England and London Express Service, by the 11 a.m. train from Penzance (2.20 p.m. from Plymouth) being altered to run *viâ* Westbury, arriving at Paddington at 7.35 p.m., effecting a saving of 40 min. The train will call at Westbury at 5.53 p.m. to give the Weymouth district the benefit of the faster service to Paddington. The 4 p.m. from Weymouth will be timed to meet the Express from Penzance. For the convenience of visitors to the Channel Islands a steamer will leave Guernsey at 10 a.m. on Sundays, August 3, 10, 17, and 24, connecting at Weymouth with the 4 p.m. express, due at Paddington at 7.35 p.m. There will also be a steamer from Jersey on Sunday nights August 3, 10, 17, and 24, starting at 10 p.m. and running direct to Southampton, connecting with a train due at Waterloo at 9.32 the following morning. The through service between Bristol and York is dealt with in the Great Central Section. In the Midland district there is a new train designed to assist the holiday traffic between Birmingham and the Isle of Man. On Fridays and Saturdays, July 25 to August 16 inclusive, leaving Birmingham at 7.20 a.m. and Wolverhampton at 7.45 a.m. it will run non-stop to Birkenhead (Woodside) arriving at 9.52 a.m. enabling passengers to join the 10.30 a.m. boat from Liverpool, arriving at Douglas about 2.15 p.m. For the return journey a similar train will run on Saturdays and Mondays from August 2 until August 25 inclusive.

LANCASHIRE AND YORKSHIRE RAILWAY.

In conjunction with the London and North Western Railway, a new service will be run between London and Blackpool, leaving Euston at 10.5 a.m.; and on Mondays, Fridays, and Saturdays there will be through carriages for Fleetwood in connection with the afternoon steamer for Douglas (Isle of Man). Additional trains are to run between Accrington, Blackburn, and Blackpool, week-days, leaving the former place at 7.16 a.m., and returning from Blackpool (Central) at 6 p.m. On Sundays a new train will leave Colne at 12.45 p.m. for Blackpool, calling at stations in the East Lancashire district, and returning from Blackpool (Central) at 9.20 p.m. The electric train service between Southport, Meols Cop, and Crossens will be revised and augmented on week-days. In connection therewith, the rail motor services between Southport, Barton, and Altcar, and Southport and Tarleton have been revised. Numerous changes are made in the Sunday services, with the object of providing for the increasingly heavy traffic. Important alterations are introduced in the service between Huddersfield, Sheffield, and London (St. Pancras), additional through carriages being run *viâ* Thornhill, and the timing expedited as follows:—On Saturdays a new train will leave Huddersfield at 11.50 a.m., connecting at Mirfield with the through train from Halifax to Sheffield. A new train will leave Huddersfield at 12.35 p.m. (Saturdays excepted), with through carriage for St. Pancras (due 4.45 p.m.). Another new through carriage will leave Huddersfield at 5.55 p.m., and arrive St. Pancras 10.25 p.m. In the other direction, through carriages will be run from St. Pancras at 1.50 p.m. (Saturdays excepted) and 3.30 p.m. daily, due Huddersfield at 6.6 and 7.54 p.m. respectively. The through carriage which now leaves Huddersfield at 7.40 a.m. and returns from St. Pancras at 6 p.m., will continue to run, and passengers will thus have a good choice of through fast trains each way throughout the day.

LONDON AND NORTH WESTERN RAILWAY.

Owing to the fact that its facilities have already reached a standard which admits of little, if any improvement, there are few train service developments of note to be credited to the "premier" line, but there are several detail alterations which may be referred to. The summer time-tables will take effect from Saturday, July 12, but, following last year's practice, some of the summer trains, particularly in the Scottish services, commence at the beginning of July. On Saturdays the 8 a.m. special excursion from Euston to Windermere and Blackpool will again run, as also the 9.42 a.m. from Cambridge to Windermere and Penrith. From Liverpool to Euston, the 11 a.m. express, with through carriages from Birkenhead and Oxford Road (Manchester) will convey Eastbourne vehicles only as far as Crewe, where they will be transferred to the Manchester train. The Liverpool-Euston train will be booked to leave Crewe at 12.6 p.m., and run through to Willesden without stop, reaching Euston at 3.10 p.m. From Shrewsbury to Stafford, with Cambrian and Central Wales vehicles for Euston, the 11.40 a.m. will be extended to London, calling at Stafford and Rugby. The 5.20 p.m. from Liverpool to Euston, will leave Crewe at 6.12 p.m., and call at Willesden at 9.3 p.m, the arrival at Euston being 9.15 p.m. as at present. Instead of the 3.10 p.m. Saturday train from Euston to Northampton—in place of the 3 p.m. on other days—the latter will run also on Saturdays, but will be fast from Bletchley to Northampton, due 5.3 p.m. The 1 p.m. from Liverpool to Manchester will call at St. Helens Junction instead of Edge Hill, while the 1.5 p.m. ceases to call at St. Helens Junction. A new train for Scarborough will (except Wednesdays and Thursdays) leave Liverpool at 11.15 a.m., calling at Manchester, Stalybridge, and Huddersfield to Leeds, whence the through coaches will be taken on by the 1.25 p.m. North Eastern train. As mentioned in connection with that company's services, a Midland train from Leeds at 9.35 a.m. will, on Monday, Tuesday, Friday and Saturday, from July 12 to September 20, travel *viâ*

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Ingleton to Penrith and Keswick over the London and North Western main line, the return train leaving Penrith at 1.35 p.m. Both trains will be non-stop between Kirkby Lonsdale and Penrith. Otherwise all last year's facilities reappear, in some cases with slight alterations in timing. Beginning on July 14 a new business man's service from Birkenhead to North Wales and back will be run. The evening train is timed to leave Birkenhead (Woodside) at 4.5 p.m., and to arrive in Prestatyn at 4.58, Rhyl at 5.6, Colwyn Bay at 5.23, Llandudno Junction at 5.33, Deganwy at 5.39, and Llandudno at 5.47. The morning train will start from Llandudno at 7.40 a.m. and arrive in Birkenhead (Woodside) at 9.21 a.m. These facilities (Saturdays excepted) will tend still further to induce "Merseyites" to adopt North Wales as a residential resort, and also create a healthy rivalry with "Cottonopolis" as to which shall have the best patronised club train to the coast. A new dining car express will leave New Street, Birmingham, on week-days commencing July 1st, at 8.10 p.m., due in Euston at 10.10 p.m., without intermediate stoppage.

LONDON AND SOUTH WESTERN RAILWAY.

The London and South Western Company have adopted the practice of issuing one time table to cover the period from June 1 to September 30, so that some of the facilities to be noted are already available, while others come into force on specified dates or apply to stated periods. Speaking generally, last year's arrangements are repeated, with a few changes conducing to public convenience, and in some instances materially accelerating certain services. The 11 a.m. West of England express is, with slight alterations, again replaced by a series of trains. The 10.50 a.m., during July, August and September, will be a Sidmouth and Plymouth express, with luncheon car to Exeter, running non-stop to Salisbury, and calling at Sidmouth Junction, Exeter, and certain stations beyond. From July 18 to September 29 inclusive, the 11 a.m. train, calling at Salisbury only to Exeter, will be a North Cornwall and Bude corridor express, with luncheon car for Padstow. The 11.10 a.m. train, calling at Salisbury only to Exeter, will run during July, August and September for North Devon stations and Ilfracombe, with a luncheon car to Torrington. A relief to the 1 p.m. express will leave at 12.50 p.m., from July 18 to September 20, for Sidmouth and North Devon, with luncheon car to Torrington. This will call only at Salisbury and Sidmouth Junction to Exeter, giving arrivals at Sidmouth 4.28 p.m., Exeter 4.15 p.m., Barnstaple 5.26 p.m., Bideford 5.50 p.m., Torrington 6.3 p.m., and Ilfracombe 6.22 p.m. The 1 p.m. express will call at Axminster and Seaton Junction, enabling passengers to reach Lyme Regis at 4.52 p.m. and Seaton 4.53 p.m., 78 and 66 min. earlier than hitherto. Instead of running behind the 12 noon from Exeter to London (Plymouth express), the Torrington (9.55 a.m.) and Ilfracombe (9.40 a.m.) trains in force from July 19 to September 22 inclusive, will run in advance, leaving Exeter at 11.45 a.m., calling only at Salisbury, and reaching Waterloo at 3 p.m. The 12 noon express retains the same timing as formerly. Connections with the 12.55 p.m. express from Exeter to London will leave Torrington at 11 a.m., Ilfracombe 10.45 a.m., and Sidmouth 12.37 p.m. Sunday connections from Torrington and Ilfracombe with the 4.30 p.m. dining car express from Exeter to Waterloo (due 8.30 p.m.), leave at 2.25 and 2.28 p.m. respectively, instead of 2.30 and 2.15 p.m. as last year. As regards the Southampton and Bournemouth route, the 9.45 p.m. express from Waterloo to Southampton Docks, with passengers for Paris and the Channel Islands, will be made up of corridor vestibuled stock with a supper car. The return steamer express will leave Southampton Docks, as a breakfast car train, about 7 a.m. (Tuesdays to Sundays inclusive), arriving at Waterloo about 9 a.m. and on Sundays at 10.39 a.m.

LONDON, BRIGHTON AND SOUTH COAST RAILWAY.

On this railway the chief feature is the introduction of 85-minute express trains from Eastbourne to Victoria, and of further 90-minute trains in each direction. Trains having the new accelerated booking, five minutes faster than has previously been scheduled, are the 9.35, 11.45 a.m. and 6.15 p.m. from Eastbourne to Victoria. The 8.30 a.m. to London Bridge remains as a 90-minute train. Beginning June 25, the 5.5 p.m. from Eastbourne starts five minutes later, but will still be due in Victoria at 6.40 p.m. Including existing and new schedules, the down 90-minute trains are the 11.15 a.m. from Victoria, the 1.10 p.m. (Saturdays only, commencing July) from Victoria, the 5.5 p.m. from London Bridge, the 5.20 p.m. from Victoria (91 minutes), and 12.5 midnight from Victoria on Wednesdays. This last-mentioned train is an addition to the present 12.5 midnight express from Victoria to Brighton, the Eastbourne portion being detached at Hayward's Heath. A large number of accelerations and improvements are included, most of which came into force on June 2, the summer timetables of this Company being issued for the period from June to September. As regards other alterations the following may be mentioned:—From Victoria at 8.20 a.m. (not Monday) arriving at Eastbourne 9.57 a.m., Bexhill 10.13 a.m., St. Leonard's, 10.21 a.m., and Hastings 10.30. The usual cheap day return tickets are issued by this train. From Bognor 12 noon arriving at Victoria at 2.35 p.m.; 12.35 p.m. (not Saturday) Worthing to London Bridge also serves Victoria, arriving at 2.35 p.m.; 8.45 p.m. from Victoria to Eastbourne, arriving 10.34 p.m. The 6.15 p.m. from Victoria is a train for Ryde and the Isle of Wight every Thursday and Friday in June and every week-day, commencing July; 8.35 p.m. from Victoria to Bognor arriving at 10.32 p.m., Chichester 10.30 p.m., Portsmouth Town 10.55 p.m.; from Bognor 7.35 p.m., arriving at Victoria 9.26 p.m. On Sunday from Victoria 11.15 a.m., arriving at Worthing 1 p.m. The 11.5 a.m. express from Victoria to Brighton on Sundays is now available for third class passengers. The 90-minute Sunday non-stop Pullman Limited express from Victoria, 10.45 a.m. to Eastbourne and 5.15 p.m. Eastbourne-Victoria have third class carriages attached. The usual additional summer trains will be reinstated and the inter-coastal services will be improved by through expresses between Hastings and Portsmouth.

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MIDLAND RAILWAY.

Summer arrangements on the Midland Railway will, as usual, take effect from July 1, when additional and improved services come into operation affecting Scotland, the Lake District, the Isle of Man, Buxton, Matlock, Harrogate, Ilkley, the Eastern Counties, North and West of England. The through express from St. Pancras for Scotland at 11.50 a.m. will again run through to Carlisle without calling at any station, one stop only being made for engine purposes. Through services to Cromer, Yarmouth, and other places on the Norfolk Coast come into force on July 11. A through train will be run from Leeds to Keswick at 9.35 a.m., returning at 12.53 p.m. on Mondays, Tuesdays, Fridays and Saturdays from July 12 to September 20. This train will stop at Ingleton (London and North Western Railway) and Kirkby Lonsdale. A much improved service will be given from Newcastle and other important towns on the North Eastern line to the Isle of Man by the Heysham route *vid* Harrogate, Otley and Skipton by the 3 p.m. boat from Heysham and 9.30 a.m. boat from Douglas. Through trains will be arranged between Harrogate and Skipton conveying the through carriages for Heysham. A new train will be run from Ilkley to Harrogate in connection with the 6.30 p.m. Ilkley to Manchester (through train). This will improve the service between Colne, Burnley, Accrington, and other stations and Harrogate. Hunslet and Cheadle Heath stations are to be opened on Sundays. The Redditch and Evesham line will also be opened on Sundays. Additional through carriages affecting the Lancashire and Yorkshire system are referred to in the section devoted to that railway.

NORTH BRITISH RAILWAY.

The North British Company indicate that they appreciate the importance of providing for the traveller from the town to the country and seaside during the summer months, by the number of improvements incorporated in the new time tables. Most of these relate to facilities between Edinburgh and Glasgow and the various coast resorts, but the Londoner has not been lost sight of, a much improved service being provided between London and North Berwick and St. Andrews which will be most acceptable to the golfing enthusiast. This year the Lothian Coast express will be run on Saturdays as well as on other week-days. The Saturday train, leaving Glasgow at 12.37 p.m., will be due to arrive in North Berwick at 2.23 and in Dunbar at 2.27 p.m. Through carriages will be run from North Berwick to London (King's Cross) by the train leaving North Berwick at 12.30 p.m., and from London to North Berwick by the train leaving King's Cross at 11.20 a.m. A connection will also be given from North Berwick at 10.45 (10.38 Saturdays) p.m. with the 10.40 p.m. train from Edinburgh to London (King's Cross), which will this year start at 10.35 p.m.; and in the opposite direction a through sleeping carriage for North Berwick will be run on the 11.45 p.m. train from London (King's Cross), reaching North Berwick at 9 a.m. A new connection will be given from St. Andrews at 8.13 a.m., connecting at Leuchars with the 6.20 a.m. train from Aberdeen, which will be appointed to call at Leuchars. This will provide a day service from St. Andrews to London (King's Cross). The express train between Edinburgh and the Fifeshire resorts, which has hitherto not commenced running till the 1st of August, will now begin to run on July 1, leaving Edinburgh at 4.44 p.m. for the Fifeshire resorts, the return train leaving Crail at 7.30 a.m., and reaching Edinburgh at 9.25 a.m. Numerous other alterations of a local character are also included.

NORTH EASTERN RAILWAY.

On this line the summer time-tables will apply as from July 1. A through carriage will run from Glasgow (*vid* Edinburgh and Newcastle) to Hull (Riverside Quay), in connection with the boats to Rotterdam and Zeebrugge, leaving Glasgow at 8.45 a.m., Edinburgh at 10.25 a.m., and Newcastle at 2 p.m., and being transferred at York to the 3.55 p.m. boat express to Hull (Riverside Quay). In the opposite direction, a new train will leave Hull (Riverside Quay) for York (Mondays excepted) at 12 noon in connection with the incoming Rotterdam boat, and arrive in York at 1.10 p.m., and a through carriage for Glasgow will be transferred at York to the 1.42 p.m. train for Newcastle and Edinburgh. At present passengers from the continent have to cross the town to Hull (Paragon) station to catch the 12.5 p.m. train to York, and must change at York for Newcastle and the north. A through carriage will run each way between Newcastle and Scarborough the departures being respectively 12.20 p.m. and 11.12 a.m. Additional residental expresses will run from Bridlington at 7.55 a.m. for Sheffield, returning from Sheffield (M.R.) at 4.42 p.m. They will call only at Rotherham, and will include respectively a breakfast and a tea car. The 7.32 a.m. from Filey will connect with the former trains mentioned, while the 4.47 p.m. express from Leeds will be extended to Filey. Other improvements will be made in the services between Filey, Bridlington and Scarborough and Leeds, in order to better the connections with other railways at Leeds. The through carriage from King's Cross for Stockton and West Hartlepool will run on the 1.5 p.m. from London instead of the 1.40 p.m., and be transferred at York to the 4.55 p.m. trains for Newcastle. This arrangement will lessen the journey time from London by nearly half-an-hour. A new station at Easington, between Seaham Colliery and Horden will be opened for traffic.

SOUTH EASTERN AND CHATHAM RAILWAY.

First and foremost among the alterations announced by this company for the summer months is the new week-day Continental express service already mentioned in these pages, commencing in July, leaving Charing Cross at 4.30 p.m. with a non-stop run to Dover Pier, doing the journey of 76½ miles between these points in 1¼ hours and due to reach Paris at 11.25 p.m. A dining car will be included in the train from Calais to Paris. The corresponding inwards service will leave Paris at 12.30 midnight. This service will commence from the midnight of June 30, and run on Sunday nights but not on Saturday nights from Paris. The train will be formed with a sleeping car between Paris

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and Calais, and be run at a moderate rate of speed, to enable passengers to have comfortable rest. On this side of the Channel the train will leave Dover Pier at 8.20 a.m., due at Charing Cross 10.15 a.m., and a breakfast car will be provided in the service. Other alterations in the Continental services will take place, namely, the 2.20 p.m. express from Charing Cross to Folkestone, Boulogne, etc., will, commencing July 1, leave London at 2.5 p.m. The 8.35 p.m. service Victoria to Folkestone Harbour and Flushing, etc., now leaves at 8.30 p.m. (Holborn and St. Paul's 8.25 p.m.). These latter alterations apply both week-days and Sundays. The ever-increasing popularity of the Kentish Coast resorts has been met by the provision of additional express services over and above the extra trains provided last year. A new "Limited" express train will leave Victoria at 3.20 p.m. on week-days for Westgate and Margate. This train ran for a short period last year, but only on Fridays and Saturdays. On Saturdays only in July and August (August 2 accepted) a new through excursion will leave Reading at 5.45 a.m. for Canterbury, Margate, Ramsgate and Deal, returning the same day. On the Gravesend West Street branch a new "halt" has been opened at Longfield (close to Fawkham), and the service of trains between Gravesend West Street and Farningham and Swanley Junction has been entirely remodelled—almost doubled, both week-days and Sundays. Commencing in July the 6.15 p.m. from Cannon Street to Ramsgate will run fast from Faversham to Margate, reaching the latter station 16 min. earlier. A portion for passengers to intermediate stations will follow closely. In the Hastings service, the 7 a.m. up slow train, Tuesdays to Saturdays, will be superseded by the 7.7 a.m. Mondays only accelerated timing, which will be put into force every week-day. The 8.40 a.m. "Car" express from Hastings to London has been further accelerated, and now leaves at 8.45 a.m., reaching Cannon Street 10.15 a.m., thus bringing Hastings within 1¼ hours of London. The through fast train from the Great Western Railway for Folkestone, Dover and Deal, leaving Reading at 2.55 p.m. on week-days, has had several stops eliminated, and is booked to reach Deal at 6.16 p.m.—a gain of 14 min. On the various local lines in the London area numerous alterations and accelerations have been introduced. Commencing in June a new through service came into force, leaving Ramsgate Harbour at 10 a.m. (calling at Broadstairs, Margate, and Westgate) for King's Cross (Great Northern Railway), reaching that station at 12.10 p.m., so as to connect with the 12.30 p.m. luncheon and dining car express for the Midlands and northern towns. In the reverse direction through carriages leave King's Cross at 2.55 p.m. for Westgate, Margate, Broadstairs and Ramsgate, connecting at Herne Hill with the 3.25 p.m. "Granville" express from Victoria.

Several other railways provide useful developments, which may be briefly summarised:—

CAMBRIAN RAILWAYS.—The summer service on these lines is to operate from July 12, and accelerated facilities will be afforded between the principal industrial centres and the Cardigan Bay resorts, and spas of Mid-Wales. For the convenience of tourists, a motor train specially designed as an observation car, will make several journeys daily between Fairbourne, Barmouth, Harlech, and Portmadoc.

FURNESS RAILWAY.—In addition to the comprehensive facilities which the Furness Railway Company run during the summer months, a considerably improved service will be brought into force on July 1. The principal changes will be a new fast train leaving Barrow for Whitehaven at 11 a.m., calling at Millom, Seascale and St. Bees only, and running in connection with the 9.30 and 9.50 a.m. trains from Carnforth. The slow train from Barrow to Whitehaven will leave at 11.10 a.m. as at present. In order to accelerate the service from Whitehaven, a new slow train will leave Whitehaven at 1.30 p.m. in connection with the 2.45 p.m. train from Millom to Carnforth, and the present 2.20 p.m. slow train from Whitehaven to Carnforth will become fast, leaving at 2.45 p.m. and calling at principal stations only.

HIGHLAND RAILWAY.—The "Further North" express train, which formerly ran from Wick to Inverness once a week (Thursdays only) and from Inverness to Wick on Fridays only, will this season run in each direction two days a week: Inverness to Wick on Wednesdays and Fridays, and Wick to Inverness on Thursdays and Saturdays.

ISLE OF WIGHT CENTRAL RAILWAY.—This Company has arranged to run a new passenger train daily (commencing July 1), leaving Ryde Pier Head at 9.25 p.m., and providing connections for Newport and Cowes, and intermediate stations off the 6.40 p.m. London and South Western express from Waterloo to Portsmouth. The summer time tables on the Isle of Wight Central Railway were brought into force on June 1, and the usual additional trains will be run from July 14. The coaching stock generally on the railway has been completely overhauled and renovated, and the increased comfort ensured, combined with the reduction of fares already referred to in these pages, are resulting in substantially increased passenger receipts.

MIDLAND GREAT WESTERN RAILWAY OF IRELAND.—The chief change in the summer train services announced by this company, operative from June 2, is the re-timing and acceleration of the morning express from Dublin to the West of Ireland. In previous years the train was timed to leave Broadstone at 9.15 or 9.45 a.m. This involved slow running and delays on the Mayo line, in order that connections with Great Southern and Western trains at Claremorris might be made. Under the revised arrangement the train leaves Broadstone at 10.30 a.m., being accelerated on the Galway as well as on the Mayo line to the extent of about 35 min. The limited mail trains, up and down, run in connection with the cross-Channel service, *viâ* Kingstown and Holyhead, are timed as last summer, but a new connection with Galway is run from Dublin at 8.40 a.m., a corresponding train leaving Galway at 12 noon for Dublin.

NORTH STAFFORDSHIRE RAILWAY.—On this line the usual summer service of trains will be run from Saturday, July 12, to September 30. In addition to the through express leaving Derby at 11.25 a.m. for Llandudno, there will be a new train leaving Derby at 10.45 a.m. for Crewe, with excellent connections for Swansea and Liverpool. The latter train will also act as a relief and feeder to the Llandudno express. The beautiful golf links at Rudyard (18 holes) continue to prove a great attraction, and owing to the number of visitors from London, Manchester, Liverpool, and the Potteries, additional trains are being run from Manchester and Stoke, and the service is to be accelerated.

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PERTINENT PARAGRAPHS

The Channel Tunnel.

We are not in the least surprised to find that the pointed reference made in the last issue of the Railway Magazine to the revival of the Channel Tunnel project has attracted attention at home and abroad. The *Daily Graphic* has since taken up the subject with enthusiastic vigour by presenting the views of public men, with the object of showing how completely the old hostility to the scheme has disappeared, and establishing the fact that the people who formerly regarded the proposed tunnel as a source of national danger are now strongly insisting that it is essential to the country's safety. Thus have the promoters of the great undertaking been completely but not unexpectedly justified in the attitude which they have from the first assumed. Thanks are due in a very large degree to Mr. Arthur Fell, M.P., who, having no pecuniary interest to serve, has not merely written a useful pamphlet, but been the means of securing the formation of an influential committee of members of the House of Commons, representing all parties, in order that the construction of the tunnel may be strongly advocated; and it is extremely probable that a similar committee in the House of Lords will be appointed. Meantime, the separate inquiries announced by the Prime Minister are proceeding at the Admiralty, the War Office and the Board of Trade, and it is highly probable that before the end of the present Session—or at the latest early in that of 1914—Mr. Asquith will be in a position to make to Parliament an extremely important announcement in the matter.

* * *

Singer Workmen's Trains.

Nearly all railways serving industrial districts run for the convenience of workmen and others employed by large manufacturing firms a number of trains which do not appear in the public time tables. In the Glasgow area traffic of this class is probably more extensive than in the neighbourhood of any other of the large towns, and we are indebted to Mr. W. F. Jackson, General Manager, North British Railway, for the following particulars of the special traffic run by that company for the benefit of employés of the well-known Singer Manufacturing Company:—"Passengers travelling between Glasgow and Helensburgh or to and from the Clyde resorts, *viâ* Singer, cannot fail to notice the large red building close by the side of the line, with stacks of wood and other material here and there in front of it, and situate in the midst of a great and growing industrial and maritime district. No one can really miss seeing it, surmounted as it is by a conspicuous tower, the clock face of which

Photo] [*J. R. Sutherland, Edinburgh.*

TRAINS WAITING AT SINGER FOR THE EMPLOYÉS OF THE SINGER MANUFACTURING CO.

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indicates in bold lettering that this is the Singer Manufacturing Company's Works. Upwards of 13,000 workmen are employed in this gigantic building, and it is a notable fact that the Board of Trade export figures are materially affected by the extraordinary output of this firm alone. Possibly more workmen's trains are run daily to and from the huge establishment than in connection with any other firm's works. It is not, however, for the want of room to build workmen's dwelling houses in the vicinity that this is necessary. On the contrary, ever since Singers' manufactories were opened, most of the workmen have travelled to and from Glasgow —a distance of about ten miles. Even now, more than half the workmen so employed travel to and from the city, and this, notwithstanding the fact that many dwelling houses (cheaper than those of the same order obtainable in Glasgow) have within recent years been erected near the works. It seems that many of the employés prefer to do so in order to keep their families together, many of whom are engaged in different occupations in the city. No fewer than seven workmen's trains arrive at Singer station from Glasgow between 6.19 a.m. and 6.45 a.m. daily, the same number returning every evening except Saturdays and Sundays between 5.51 p.m. and 6.15 p.m. A workmen's train is also run to and from Balloch, 12 miles distant, calling at intermediate stations. On an average, each of these trains is composed of 17 vehicles, and carries about 840 passengers. Some of the compartments are reserved for foremen, and some for women workers; while others are commandeered by certain workmen who form themselves into special parties, travelling regularly together morning and evening. The North British Company have a grave responsibility as regards good time-keeping with these trains. As a rule, one department of Singers' workmen cannot proceed with a given work unless certain other departments are working along with them. So that, if one of the trains happen, by unforeseen circumstances, to arrive behind time, not only do those who are in the belated train lose time and money, but also those who have to remain idle at the works till the late workmen put in an appearance. Everything possible, however, is done by the North British Company to ensure punctual arrival. Special platforms have been erected at Singer station; a committee of workmen sees that the men are detailed to the various trains; and, indeed, the traffic is so well regulated by the Company's officials that it is only under the most exceptional and unavoidable circumstances that the trains are not run strictly to their scheduled time." A photograph showing trains waiting at Singer station is reproduced. The selection of engines attached is not the least interesting feature of the scene.

* * *

Open Composite and Third Class Vehicles for Rail Motor Traffic: London and North Western Railway.

FOR use in rail motor trains, adapted ordinary vehicles or ordinary trailers have hitherto sufficed on the London and North Western Railway, but in view of the necessary number of such services, Mr. H. D. Earl has recently placed in traffic a number of special cars expressly designed to meet the conditions associated with rail motor car services. There are two types of these vehicles, composites and third class, and in the illustrations on this page an example of each is shown. With bodies are 57 ft. long by 9 ft. wide, the composite consists of three passenger compartments—two first class (one smoking) 6 ft. 6 in. long and seating 6 passengers each; and one third class (smoking) 25 ft. 3 in. long and seating 40 passengers. A driving compartment is provided at the end next the third class division, and a luggage compartment at the other end, with vestibule in the centre of the car. The third class vehicle consists of two open compartments, each 20 ft. 3 in. long, seating 64 passengers, with a combined driver's and luggage compartment at one end and a vestibule in the centre. Entrance is by the vestibule in the centre. Folding steps are attached to enable passengers to enter or leave the train from the level of crossings. The framing of the coach bodies is of teak, panelled in mahogany, and the vehicles are painted in the standard colours of the London and North Western Railway. Internal finishing is of framed and panelled polished teak throughout. Balance blinds with hinged hood mouldings are fixed to the windows, and there are self-contained luggage racks for light articles on the partitions. All doors leading to the compartments are of the sliding type.

First class seats are self contained and similar to those in dining cars, the chair ends being of polished teak, and the seat and back upholstered in Saladin moquette. Third class seats are Wolverton pattern motor car seats, not reversible, but fixed to face in one

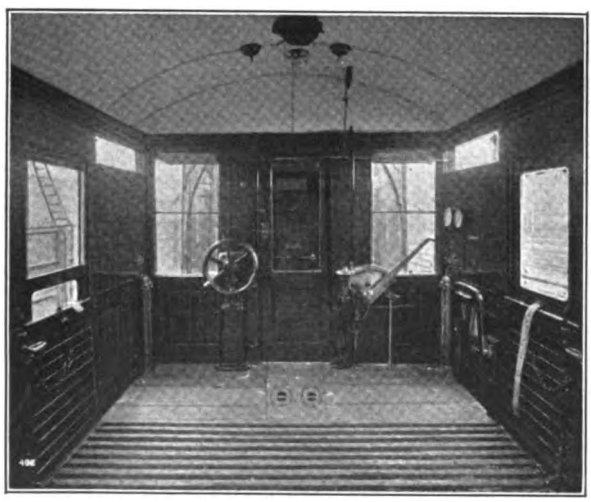

Photo [*L.N.W.R.*

INTERIOR OF DRIVER'S AND LUGGAGE COMPARTMENT: NEW TRAILER CARS FOR MOTOR TRAINS, LONDON AND NORTH WESTERN RAILWAY.

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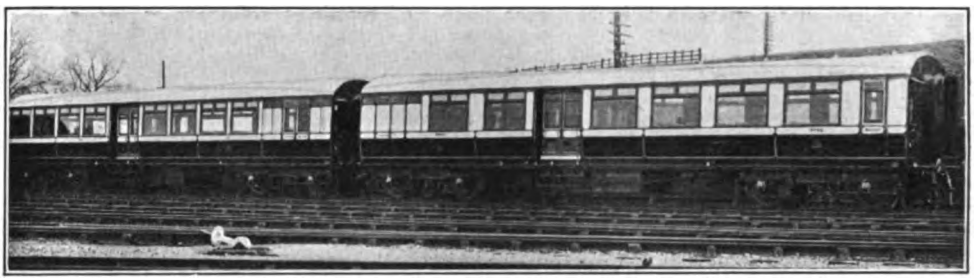

Photo] [*L.N.W.R.*

NEW TRAILER CARS FOR RAIL MOTOR TRAINS: LONDON AND NORTH WESTERN RAILWAY.

direction down one side of the car, and in the opposite direction on the other side. These seats are upholstered in crimson rep. Throughout the ceilings are panelled in 3-ply, painted white, and the floors are covered with "Kork" lino. A "Fare list" frame, and "Please take one" box is fitted in each compartment. The vestibule contains a stationery box, collected ticket box, letter rack, and a folding seat for the guard. In the driver's compartment is the driving gear, such as regulator lever, whistle lever and pulley, sanding gear, and fire extinguisher. A hand brake and application brake valve are placed in a convenient position for the driver, as also are the vacuum and steam gauges, brackets for single line staff and electric bell push. The engine is operated from this compartment by means of a shaft fixed under the carriage underframes, and connected between the coaches by means of a sliding coupling. Communication between driver and fireman is made possible by means of electric bells in the engine cab and driver's compartment, there being a standard code of signals, a list of which is displayed in each driver's compartment. The vehicles are mounted on underframes made of rolled steel sections, and carried on four-wheeled bogies. They are fitted with vacuum brake, electric light, Wolverton "direct system" of steam heating, and are well ventilated with torpedo vents in the roof, and there are folding glazed vents over the lights, with deflectors.

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P.L.M. Summer Services.

RECENT developments in Continental railway routes have led to great improvements in train services and travel arrangements. In the case of the Paris-Lyons-Mediterranean Railway the changes are particularly noticeable. A through carriage will run from July 1 in connection with the 2.5 p.m. train from Charing Cross between Boulogne and Lausanne. The Simplon route *viâ* Southern Switzerland is now the quickest, and, with the new arrangement, the most comfortable route to Northern and Eastern Italy. Passengers wishing to travel leisurely may reach the Simplon *viâ* Pontarlier, the Bernese Oberland and the recently opened Lötschberg tunnel. The new short-cut between Frasne and Vallorbe, avoiding Pontarlier, soon to be opened, will further curtail both the distance and the time between Paris and Milan. Cheap excursion tickets are being issued by the Paris-Lyons-Mediterranean Railway in order to open up new holiday districts, easily reached from England. On July 12, August 2 and 30 these tickets will be available to Auvergne, Dauphiny, Savoy, Provence and Corsica, the cheapest return fares from London being: Clermont-Ferrand, £2 4s. 5d.; Chamonix, £2 17s. 2d.; Grenoble, £2 13s. 10d.; Nice, £3 17s. 6d.; Cette, £3 10s. 3d.; Ajaccio, £4 19s. 1d. These tickets cover the Dover-Calais, Folkestone-Boulogne or Newhaven-Dieppe routes between London and Paris, thence by the Paris-Lyons-Mediterranean. Several services are available on the dates specified, and the tickets, which are valid for 25 days, include various break of journey facilities. The Paris-Lyons-Mediterranean Railway has issued the first section of an atlas of the system. It embraces the whole of the Rhone Valley from Lyons to Marseilles, contains many views and a good map of the district, with two splendid pictures in colours—a ceremony in the Temple of Livia at Vienne and a "farandole" of Provence. RAILWAY MAGAZINE readers may obtain this atlas free on application to the Paris-Lyonse Mediterranean Railway Offices (Dept. Atlas), 179, Piccadilly, London, W., where particulars of the cheap excursions and other facilities will also be furnished.

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North British Locomotives.

REFERRING to Mr. Bowman's article on this subject in our last issue, Mr. Alexander Ramsay points out that it is hardly correct to describe the 883 series as belonging to the "Scott" class. This must be largely a matter of opinion, though, perhaps, it would be more exact to refer to them as "mixed-traffic" adaptations of the "Scott" design. The same correspondent also gives a few other particulars which may be summarised as an addendum to Mr. Bowman's article. Of the enlarged "Scotts," ten were built at Cowlairs in 1911, and two, Nos. 363 and 400 (both fitted with Schmidt superheaters) in 1912; No. 400, *The Dougal Cratur* is illustrated on another page of this issue of the RAILWAY MAGAZINE; No. 363 bears the name of *Hal o' the Wynd*; No. 897, *Redgauntlet*, was for a time fitted with the Phœnix superheater, but this has been taken out. The working pressure of the 317 class is 180 lbs. per sq. in. Mr. Drummond's intermediate 4–4–0 engines, originally built for the West Highland trains, might also be mentioned. They have 19 in. by 24 in. cylinders, 5 ft. 7 in. coupled wheels, 150 lbs. steam pressure, 1,235·13 sq. ft. of heating surface, and weigh 43 tons 6 cwt. These engines are now principally employed on secondary duties. Our correspondent expresses

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a very favourable opinion of the 729 class, on the basis of many journeys with express trains between Edinburgh and Glasgow, and gives particulars of several runs by the 4 p.m. from Edinburgh on its original timing—due Queen Street 5.7 p.m. He writes: "With a net load of 232 tons, and locomotive No. 598 (7 ft. wheels), we left Haymarket at 4.5.20. Gogar, 4 miles out, was passed at 4.13.0; the 9 miles thence to Philpstoun occupied 11 min. 20 sec., while the 3 miles between Philpstoun and Linlithgow were covered in 2 min. 40 sec.; Falkirk (24 miles from Haymarket) was passed at 4.35.6; the train halting at Cowlairs 23 min. 24 sec. later (20¼ miles), and Queen Street was reached at 5.7 precisely. With No. 735 and 205 tons behind the tender, I had a splendid run. Haymarket was left at 4.4.30; Gogar was passed at 4.11.25; the 9 miles to Philpstoun took 9 min. 35 sec.; and the succeeding 11 miles to Falkirk were covered in "even time," while the 20¼ miles pass to stop from Falkirk to Cowlairs, occupied 21 min. 30 sec. Queen Street was easily reached at two minutes past five, no less than five minutes before schedule time. With No. 318 and 231 tons, the train left Haymarket at 4.5.0, and passed Gogar at 4.12.19. The 9 miles to Philpstoun took 9 min. 55 sec., and the 11 miles from Philpstoun to Falkirk 11 min. 24 sec., while the remaining 20¼ miles to Cowlairs were covered in 23 min. 11 sec. Ultimately we arrived in Queen Street at 5.6. A run with a splendid finish was one I had with 4–4–2 locomotive No. 877 *Liddesdale* and 290 tons. We left Haymarket at exactly 4.5. To Gogar occupied 6½ min.; thence to Linlithgow (12 miles) took 14 min.; Linlithgow to Falkirk (8 miles) occupied 8 min., while Falkirk to Cowlairs (20¼ miles) required only 19 min. After a halt of 3½ min. at Cowlairs and a slow descent of the bank, the train reached Queen Street at 5.3.30."

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Long Service on the Great Central Railway.

The *Sheffield Telegraph* publishes particulars of the long railway service of two brothers, Messrs. E. S. and A. J. Crawford, who recently retired from the active list of the Great Central Railway. Mr. E. S. Crawford claimed 49 years duty in the locomotive department, beginning, of course, with the Manchester, Sheffield and Lincolnshire Company, while his brother, who was chief clerk at Bridge-houses goods station, completed almost 50 years service. "Mr. E. S. Crawford has," says our contemporary, "good reason to remember the date of his first acquaintance with the footplate, for it was in 1864, memorable as the date of the Sheffield Flood. As a fireman, he was trained by the late Samuel Cawood, the driver who was in charge of the train from which the notorious Charles Peace escaped when being brought to Sheffield for trial. The working of trains was controlled only by hand brake on the tender and the guard's van, which generally did not exceed six tons, and Mr. Crawford's experience covers the early simple vacuum brake. Formerly, water was supplied to the boilers by pumps, which occasionally failed, or in winter got frozen, and required constant watching, and gave endless difficulties. Fixed signals also were not very numerous, and drivers exchanged signals with each other when passing, to acquaint themselves with the trains that were before them, and from this crude and unsatisfactory system Mr. Crawford can recall the changes that developed into the present complicated system of interlocking points and signals.

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Norwich to Aberystwyth by Through Excursion Train.

From Norwich to Aberystwyth by through day excursion train is a decided novelty, even in these times when day trips from London to Killarney, the Cornish Riviera, and North Wales are accepted as ordinary examples of railway enterprise. The Norwich to Aberystwyth journey was arranged on Whit-Monday by the St. Mary's Adult School (Norwich), and efficiently carried out by the Midland and Great Northern Joint Railway and the London and North Western and Cambrian Companies. The fare was 7s. 6d. for the day, with bookings for 2, 3 or 4, 5, 8 or 15 days at proportionate prices. Associated with the trip were facilities for visiting the Devil's Bridge by the Vale of Rheidol Railway at a special fare of 1s. 3d., while the Rheidol Falls could be viewed at a reduced charge on production of the railway ticket. Special arrangements were also made for inspecting the University College at Aberystwyth. The excursion included arrangements for saloon parties or reserved compartments for parties of six passengers. We are indebted to Mr. J. J. Petrie, Traffic Manager of the Midland and Great Northern Joint Railway for the following particulars:—"There were two trains, the timings being: Norwich (City) dep. 12.3 a.m., 12.27 a.m.; Aberystwyth arr. 8.20 a.m., 8.40 a.m. The route taken was *viâ* South Lynn and Bourne, the Midland and Great Northern Joint line terminating four miles beyond the latter station, but their engines worked over the Midland system into Leicester station. Onward the London and North Western Company hauled the trains to Welshpool, where the Cambrian Company's engines were attached, to take the vehicles to Aberystwyth. The actual rail distance was 295 miles. The timings of the return trains were: Aberystwyth dep. 7.50 p.m., 8.5 p.m.; Norwich (City) arr. 4.58 a.m., 5.10 a.m. The stock used was mainly Midland corridor coaches.

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Advertising Health Resorts and Watering Places.

A Bill was last month introduced in the House of Commons to give the same powers to the councils of boroughs and urban districts in England and Wales to advertise the advantages and amenities of their boroughs and districts as health resorts or watering places as are possessed by local authorities in Ireland under the Health Resorts and Watering Places (Ireland) Act, 1909. A proposal to effect the same purpose has been brought forward on behalf of Wales and Monmouthshire. But having regard to the course of political events, and to the fact that the Government have now taken the whole time of the House of Commons, it is extremely doubtful whether either Bill can be passed during the present session.

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THE Belgian State Railways, in connection with the South Eastern and Chatham Company, have arranged a comprehensive series of facilities between London and Ghent, in connection with the present Universal and International Exhibition. By the Dover–Ostend route, on which the steamers of the Belgian State Railways and Mail Packet service are employed, cheap 15 day tickets are issued daily at 44s. first-class, 28s. 6d. second-class and 18s. 6d. third class. These tickets are available by the 9 p.m. train from Charing Cross (Weekdays and Sundays), due at Ghent (St. Pierre) at 4.34 a.m., and Ghent (Sud) at 4.45 a.m.; returning from Ghent (St. Pierre) at 9.36 a.m., 2.3 p.m., and 9.33 p.m. Corresponding tickets are issued from Dover on Fridays and Saturdays, available by any service, the respective fares being 16s. 2d., 11s. and 9s. 7d. First class steamer and second class rail tickets cost 12s. 10d. All these allow break of journey at Ostend and Bruges in both directions, and the return may be made by any service, according to class, within the period of validity. Hand baggage is allowed free of charge. There are three services daily by the Belgian Government mail steamers leaving Dover (Admiralty Pier) at 11 a.m., 4.30 and 11 p.m., and leaving Ostend Harbour at 10.37 a.m., 3.30 p.m. and 10.58 p.m. The splendid turbine steamers, *Jan Breydel*, *Pieter de Coninck*, and *Princesse Elisabeth*, and the paddle steamers *Princesse Clementine*, *Rapide*, *Marie Henriette*, *Leopold II.*, *Princesse Henriette*, and *Princesse Josephine*, are now running and perform the sea passage in three hours. All these vessels are fitted with the Marconi system of wireless telegraphy, and have a post office on board. Two new turbine steamers will shortly be added to the service. The Ghent (St. Pierre) station is quite close to the main entrance of the Exhibition, and the Palais de l'Horticulture et des Fetes. The Exhibition can be reached from the Ghent (Sud) Station by tramcars "No. 7," which run every few minutes. For further information, handbills, etc., application should be made to the Belgian State Railways Offices, 47, Cannon Street, London, E.C.

SEVERAL English railways are represented at the International Exhibition at Ghent, and one of the best stands is that of the Great Central Company. Among its many interesting features the one engaging most attention is the magnificent model of the new Immingham Dock. This model covers an area of 15 ft. in width by 26 ft. in length, and everything is produced to scale, the minute details being so cleverly represented that a most comprehensive idea is obtained of the dock estate, the eye being better able to imagine the huge proportions of the dock from the model than on the estate itself. Among other details shown in the model are over 3,000 coal trucks, about 30 engines, passenger and goods trains, 20 boats, and over three-quarters of a mile of sidings are employed in the model to represent the huge storage yards at Immingham. The King of the Belgians during his recent visit to the British section paid particular attention to the Immingham deep-water dock model, and expressed his admiration of the whole exhibit. Among other exhibits by the Great Central Company, is a locomotive boiler fitted with the Robinson superheater, and a remarkable series of illustrations of Mr. Robinson's 4–6–0 locomotive, *Sir Sam Fay*. Those of our readers who propose to visit the Exhibition should not fail to inspect this very attractive display. In addition to the comprehensive and cheap facilities ordinarily in operation on the Great Central routes to the Continent *viâ* Grimsby, Rotterdam, and Antwerp, a special trip, including a visit to the Ghent Exhibition, is arranged on Mondays, Wednesdays, and Saturdays, the tickets being available for return within 16 days. The fares are very reasonable, and cover first-class steamer accommodation and third-class rail. At a slightly increased fare tickets available for travel *viâ* Rotterdam are issued on Tuesdays, Thursdays and Saturdays.

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THE old irregular service of steam trains over the East London Railway has been supplanted by the regular, rapid, clean and comfortable service of electric trains of the Metropolitan Company, running from New Cross (London, Brighton and South Coast and South Eastern and Chatham) stations to all Metropolitan stations, and also to Shoreditch, giving easy and direct access to the delightful districts in the north and north-west of London, and providing for the working classes in the East End of London new holiday grounds amidst some of the most charming scenery in England. Cheap bookings are in operation for whole-day and half-day trips on Thursdays, Saturdays, and Sundays from New Cross, Surrey Docks,

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Rotherhithe, Wapping, Shadwell and St. Mary's Whitechapel stations. These health-giving beauty spots are opened up by the Metropolitan Company's trains, calling at East London Railway stations and the City stations, thence to King's Cross, Baker Street, and South Kensington, while there is a supplementary service of local trains at frequent intervals between New Cross and Shoreditch, giving a five minutes' service to and from East London stations. Full particulars as to the times of trains as also of excursion and other cheap tickets may be obtained at any East London station, at the new enquiry office in the Arcade, Liverpool Street Station (Metropolitan Railway), or from the Metropolitan Company's Publicity Department at Edgware Road Station, N.W.

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SINCE May, 1907, the North Staffordshire Railway has added to its rolling stock 64 bogie carriages of various designs and compositions of compartments, including two full saloon carriages with lavatory at one end and luggage compartment at the other end, and two saloons divided into two compartments, also with lavatory and luggage compartments. These fine carriages are in great demand for picnic and other parties. They will each accommodate 48 passengers. Since January, 1909, all the bogie stock has been built with semi-eliptical shaped roofs, which add much to the appearance and give greater height inside. The North Staffordshire Company already have eight new engines fitted with Schmidt superheaters, and, we are informed that very satisfactory work has been accomplished by them. One of these locomotives, of the 4–4–0 type having 20 in. by 26 in. cylinders, 6 ft. diameter driving wheels and a large "Belpaire" boiler will during the summer work the Derby and Burton to Llandudno through express. A series of engines is now being turned out of the Railway Works at Stoke fitted with feed-water heaters. A portion of the exhaust steam is used for this purpose, and water, near boiling point, is pumped into the boiler. This saves an appreciable amount of coal, and has the effect of lessening the wear and tear of the boiler.

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ONE of the most profitable events of the year for the Stratford-upon-Avon and Midland Junction Railway is the Shakespeare summer season. As already announced in our columns, this year it will be held at Stratford-on-Avon from August 2 to August 30. As usual, the dramatic performances will be given by the F. R. Benson Shakespearean Company, under the direction of Mr. F. R. Benson, and the following plays are announced:—"Richard the Second," "Henry IV.," part 2, "The Merchant of Venice," "As You Like It," "Hamlet,"

A NEW LONDON AND SOUTH WESTERN POSTER.
The original of this picture ranks as one of the finest colour posters produced by the company.

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"The Taming of the Shrew," "Much Ado About Nothing," "Twelfth Night," "King John," "Romeo and Juliet," "The Merry Wives of Windsor," "Richelieu," "The Tragedy of Pompey the Great," by Mr. John Masefield, and "The Devil's Disciple," by Mr. G. Bernard Shaw. During the season the Norwich players, Bedford players, and Dunmow players will also appear in various plays. Each week lectures will be given, as well as demonstrations of folk dance by the English Folk Dance Society. Classes in Folk Song and Dance are to be held daily from 9 a.m. to 12.30 p.m. A "masque of harvest," specially written and devised by Mr. F. Rundle Milliken, will also take place weekly. Fuller details of the festival may be obtained from the Box Office, Memorial Theatre, Stratford-on-Avon. The quickest and shortest route between London and Stratford-on-Avon is *viâ* Marylebone and the "Shakespeare Route" (Stratford-upon-Avon and Midland Junction Railway). A beautifully illustrated guide to Stratford-on-Avon and the Shakespeare country can be obtained gratis and post free from Mr. A. E. Diggins, Traffic Manager, Stratford-upon-Avon and Midland Junction Railway, Stratford-on-Avon.

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A SPECIAL meeting of the Lochaber District Committee of the Inverness County Council has been held at Fort-William to consider the matter of the proposed reopening of the Invergarry and Fort-Augustus Railway. Lord Lochiel, who presided, explained that the company were agreeable to accept a sum for their line which was not only within the bounds of possibility, but was also, he thought, a perfectly fair sum for them to ask. On the other hand, the North British Railway Company had agreed to offer a certain figure which, having regard to the interests of the ratepayers, was also as much as they might reasonably be expected to pay. However, there was a difference between these two figures amounting to £5,000, and that difference, it was hoped, would be made up by local contributions. If the committee agreed to a contribution they would recommend to the County Council accordingly. Application would then be made to Parliament for a Provisional Order, to be embodied in the Provisional Order which the North British Railway Company would have to introduce prior to taking over the line. This suggestion was adopted, so that there is at least a reasonable probability that the line will not after all be allowed to remain derelict.

* * *

THE new Northern Navigation Company's steamer *Noronic*, for use in connection with the Grand Trunk Pacific Railway's services, was launched last month from the yards of the Western Dry Dock and Shipbuilding Company, Limited, at Port Arthur, Canada. This vessel, admittedly the finest on the Great Lakes, is 385 ft. long and 52 ft. beam, with four passenger decks, giving accommodation for 600 first cabin passengers, or approximately equal to any two Canadian passenger steamers now plying on the Great Lakes. Built on the Isherwood system of longitudinal framing, the hull frames instead of running transversely, as in ordinary ships, run fore and aft or longitudinally, and are supported by large plate web frames, fitted transversely, spaced 10 ft. apart. This construction is very much stronger and lighter than the old system. A double bottom is fitted 4 ft. 7 in. deep, extending the full length of the vessel, and the hull is divided by eight watertight transverse bulkheads into nine compartments. Two collision bulkheads are fitted forward. There are six decks, all made of steel—main deck, spar deck, promenade deck, observation deck, boat deck and hurricane deck. The engines are of the four crank triple expansion type, built for Canadian Government requirements, for 200 lbs. pressure at the high pressure engine, the cylinders being arranged from forward to aft with low pressure, high pressure, intermediate pressure and low pressure. In connection with the Northern Navigation Company, the Grand Trunk Pacific will this summer inaugurate its passenger service between Winnipeg and Fort William with the same type of high-class trains as are now operated between Winnipeg and Tete Jaune.

* * *

THE Great Eastern Railway Company are giving practical encouragement to a scheme for the creation of a seaside village at Thorpeness, near Aldeburgh. At present the nearest railway station is at Leiston, 4 miles away, but eventually the spot may be made more accessible from Liverpool Street. The idea of establishing such a resort, which is to be essentially unconventional in character, has originated with the Seaside Bungalows, Limited, and it would have been difficult to select a place more suitable than Thorpeness for the initial experiment. This particular part of the East Coast is comparatively little known to the holiday-maker, and its natural characteristics are precisely those that would be desired for the purpose. Sand dunes are dotted along the shore on the fringe of open heath, and amid these simple natural surroundings cottages and bungalows of unpretentious but cosy character are appearing as part of the new settlement, which marks a distinct departure from all existing marine resorts in this country. Inland, and not far removed from the high-water line, advantage has been taken of a depression in the land to form a lake of 61 acres, the maximum depth of which is not more than 2 ft. In one or two places, the water is deeper, but these have been enclosed, and the whole area is, therefore, available for boating in conditions of assured safety. We believe that Thorpeness will attract many visitors when its existence once becomes more widely known, and in that case the enterprise of Seaside Bungalows, Limited, may be seen in other directions.

* * *

A GENERAL improvement in the service provided by the Metropolitan Railway to and from Harrow, Uxbridge, Rickmansworth and Aylesbury has been made. The number of through trains to the City has been increased and this will be a great advantage to passengers travelling with luggage during the holiday season to and from the various London termini. On Sundays the train leaving Baker Street at 8.42 a.m. which formerly ran to Chesham has been extended to Aylesbury, and an additional train from Aylesbury at 10.25 a.m. is now run. The widening of the line between Finchley Road and Wembley Park is well in hand, and when completed will allow of the train services being very considerably accelerated. The service on the Inner Circle section between

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TWO OF THE NEW "STANDARDISED" POSTERS ISSUED BY THE LONDON AND NORTH WESTERN COMPANY.

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the City and Baker Street, is practically continuous, 42 trains an hour being worked over that portion of the line in the busy hours of the day.

* * *

THE day tours by private automobile through "Shakespeare's Country" arranged by the Great Central Company have in previous years been so highly appreciated that similar facilities are again offered. Leaving Marylebone by the 10 a.m. express, passengers are, on arrival at Stratford-on-Avon, conveyed by private automobile to Stratford-on-Avon, Warwick, Guy's Cliffe, Kenilworth and Leamington. The tour covers 193 miles rail travel and 33 miles motor drive through typical English scenery and historical country in less than nine hours, visitors returning to London before 7 p.m., in time for dinner. The inclusive fare is only 12s., and such a tour appeals not only to American, Colonial, and Continental visitors, but also to those residing in and around London who wish to see the Shakespeare country expeditously and economically. Further particulars will be sent on application to the Publicity Dept., 216, Marylebone Road, London, N.W.

* * *

THE Great Western Company continue to put into service 4-6-0 locomotives of the two-cylinder (2900) and four-cylinder (4000) classes. No. 2953, of the former class, is named *Titley Court;* and Nos. 4042 to 4044 of the latter type are also in service. No. 4042 is named *Prince Albert*, and No. 4044 *Prince George*. The most important development in Great Western locomotive practice recently has been the fitting of Mr. Churchward's top-feed apparatus to engines with the old type of parallel boiler. Hitherto this device has been applied only to the coned pattern of boiler. Several of the old 7 ft. 8 in. singles, together with other engines of various classes, have been thus fitted. The apparatus is placed between the chimney and dome, and as other characteristics are retained, the barrel has three openings—for top-feed, steam dome and safety valve, the last being over the fire-box casing.

* * *

THE number of railways upon which Naylor's "Smokestack Black," supplied by Naylor Brothers (London), Ltd., of 407, Oxford Street, London, W., is used continually increases. In addition to more than 20 companies in the United Kingdom, the following South American lines, to which Messrs. Naylor Brothers are contractors, may be specially mentioned: San Paulo Railway (Brazil), Northern Railway (Costa Rica), Buenos Aires and Rosario Railway, Manila Railway. As regards other parts of the world, the list is a comprehensive one. This material is a brilliant black specially made for smoke stacks of locomotives. It is very durable, and will resist exposure to weather, without having to be varnished; it will stand great heat without peeling off; it can be cleaned with oil without the black being affected; it has a brilliant gloss, and when applied works freely under the brush.

* * *

MR. M. D. GREVILLE read a paper in May before the members of the Railway Club on "The Glasgow and South Western Railway," in which he gave an account of the history, development, rolling stock, facilities and steamer service of this enterprising Scottish company. "The Railways of Cornwall" was the subject of Mr. B. M. Bazley's paper at the Club meeting on Tuesday, June 10. Although prepared at short notice—Mr. T. W. D. Smith having been obliged to defer his address arranged for that date—Mr. Bazley presented a comprehensive review of the Cornish lines, covering the small and industrial systems as well as the Great Western and London and South Western routes within the Duchy. A visit to King's Cross Running Sheds, Great Northern Railway, has been arranged for July 12.

* * *

THE changes brought by time are conspicuous in the district served by the Wirral Railway, especially at the seaside resorts of West Kirby, Hoylake, and New Brighton. At West Kirby the authorities are providing promenade gardens, and the summer amusements are now in full swing. Within a mile or so is Hoylake, with its fine streets, palatial residences, and promenade. Hoylake has been developed on proper lines, with wide roads and boulevards, and is extending rapidly, constituting a garden city along the shores of the Irish Sea. With its suburb Meols, it has become the home of the Liverpool merchant. Golfing is pre-eminent and good links abound—a ladies' course at Hoylake, the Wallasey, Leasowe, Hoylake, and New Brighton Municipal courses, all attracting a full attendance. New Brighton is also progressing with the times.

* * *

WE have received Volume IV. of "Modern Railway Working." Section II.—"The Design, Construction and Maintenance of Railway Works," is completed by contributions dealing with "The Lighting of Railway Premises," written by Mr. H. Fowler (Midland Railway), and Section III.—"Railway Mechanical and Electrical Engineering" is begun. A series of articles deal with modern locomotive design, accompanied by a series of fine photographic reproductions and drawings, and following are contributions covering locomotive workshop practice and equipment. The high standard reached in previous issues is fully maintained, and as a compendium of information and data the series of eight volumes issued, as already explained, by the Gresham Publishing Co., will be almost invaluable.

* * *

A NEW catalogue has been issued by Messrs. James Walker & Co., Ltd., of "Lion" Works, Gasford Street, West India Dock Road, London, E. "Lion" packings are now very widely used for all classes of steam and hydraulic machinery, many of the specialties being employed on locomotive engines and others in general railway engineering. A characteristic feature of the goods of the company is the thin red line running through the packings, and showing whenever the packing is cut. The "Lion" expanding metallic packing for stuffing boxes, block, spiral, automatic metallic, steam hammer, and other packings, and special superheated steam packing may be mentioned, as well as rubber

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goods, buffer springs, gauge glass cone rings, hexagon gauge glass rings, hose, and boiler coverings.

* * *

WE are officially informed that as an outcome of the popular French lectures inaugurated by the London and South Western Railway Company, the first of a series of personally-conducted educational holiday tours to Normandy and Brittany by the lecturer, Professor Bisson, has been arranged for Friday, July 4, to Normandy, at a charge for the week-end of £2 10s., or for a fortnight £6 6s., including hotel accommodation, rail and steamer fares and all meals (except luncheon). These tours, besides affording a delightful holiday, an excellent opportunity of improving a knowledge of the French language under unique conditions. For booklet of itineraries apply to Professor Bisson, 8, Seely Road, Tooting, S.W.

* * *

THE Metropolitan Railway Company have prepared a set of handbills illustrating the beauty spots on the Metropolitan Extension line to Aylesbury. Provision has been made for excursions, and the fares are so cheap that the trips appeal even to the confirmed stay-at-home Londoner. The descriptive matter at the back of the handbills has been prepared from the latest information, and the illustrated portion is correctly reproduced from recent photographs. Each view is framed, and around it are illustrations suggesting the varied aspects of the county associated with the various seasons. The letterpress contains reference to residential facilities as well as general information of the railway arrangements. Single copies of the whole set of eleven may be obtained on application to the Publicity Department, at Edgware Road station (Metropolitan Railway), London, N.W.

* * *

A VERY useful rail-motor service has been established on the South Eastern and Chatham Railway between Gravesend and Swanley Junction. The train consists of a locomotive and two coaches, and, with a view to avoid the delay caused by shunting, alternative driving gear has been fitted in the rear coach, so that at the end of each journey it is only necessary for the driver to change his position. At Swanley Junction, the rail-motor connects with trains to and from London, and passengers may return either to Charing Cross or Victoria. A rail motor of similar type has also been introduced in the Otford and Sevenoaks local service.

* * *

WE are informed that the new passenger and freight yard of the Grand Duchy State Railway at Basle will be opened for traffic in September next. Constructed on a gigantic scale and splendidly equipped, the buildings have cost nearly £5,000,000, which is, perhaps, an unparalled expenditure upon a Continental line. For a long time the old passenger station had become much too small for the growing demands of traffic, and the new structure, beyond removing this difficulty, has the advantage of a more convenient situation, while the freight yard has ample connections with the improved harbour on the Rhine.

* * *

ANOTHER "Exhibition Train" has started upon a tour of about 6,600 miles through the prairie towns reached by the Canadian Railways. It carries household furniture, pianos, silver ware, kitchen utensils, stoves, radiators, carpets, oilcloths, bedding, wallpaper, cottons, woollens, knitted goods, clothing, boots, shoes, agricultural implements, pumps, hardware, harness, carriages, rubber goods, cameras, and motor-cars, all of which have been made in the Dominion. The samples cover 14,000 sq. ft. of floor space in the train, and are likely to call forth many orders where manufactories have not yet been established.

* * *

IT is announced by the Lancashire and Yorkshire Railway Company that the service between Hull and Zeebrugge will terminate this year with the sailing from the latter port on Friday, October 3, and that arrangements are being made on that occasion to run the twin screw steamer *Duke of Clarence* on a pleasure cruise from Hull to Fleetwood. The same vessel carried a large number of passengers on a similar trip from Fleetwood to Hull in May last.

* * *

THE illustration on the front cover of this issue of the RAILWAY MAGAZINE has been prepared from a photograph taken by Lieut. B. D. Holberton, R.N. It shows the 6.10 p.m. train *ex*-Weymouth, Great Western Railway, near Radipole, the engine being No. 4115 *Marigold*.

* * *

MR. HARRY WALKER, of Harry Walker & Sons (Ltd.), jute spinners, Caldrum Works, Dundee, and Captain John Gilmour, M.P. for East Renfrewshire, have been elected to the vacant seats on the board of the Caledonian Railway.

* * *

THERE are now 5,799 miles of railway in Belgium, 2,697 miles being State lines, 218 miles belonging to private companies, and 2,420 miles of light railways in actual use, with 464 miles under construction.

* * *

NEW State railways which will cost nearly £11,000,000 are proposed in Austria, Hungary and Bosnia-Herzegovina, but it is somewhat doubtful whether the lines can be begun during the present year.

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Railway Literature.

THE June number of the *Great Western Railway Magazine* appears as a souvenir of the 75th anniversary of the public opening of the Great Western Railway on June 4, 1838. Although the company was formed some time earlier, it was on the date mentioned that train services were inaugurated between Paddington and Maidenhead. A large number of portraits are reproduced covering virtually every one of note who has been or is still associated with the Company, including Chairmen, General Managers, Secretaries, Traffic Officers, Locomotive Superintendents and other departmental chiefs. Articles cover the history, rolling stock, train services, early days, the growth of the system, commercial development, introduction of safety appliances, and the battle of the gauges —all prepared on a comprehensive basis and fully illustrated. We congratulate our contemporary on the production of this souvenir number, providing as it does an invaluable record of the beginning and development of a railway the history of which is closely interwoven with that of the nation, and the operations of which are so important to the travelling industrial and commercial interests of the community as a whole.

* * *

"T.O.T.—TRAIN, OMNIBUS, TRAM" is the title of a leaflet issued for free distribution by the Publicity Department of the Metropolitan District, London Electric and associated companies, appearing fortnightly and being distributed in trains, in omnibuses and trams, as also at underground stations. It is claimed that on tramway and omnibus routes and on underground lines in London alone, there are working about 2,000 railway carriages, 2,000 tramcars and 3,000 motor buses; and the total number of miles which they ran last year was fully 200 millions, or more than sufficient to have sent a car from the earth to the sun and back. Together, they carried, in twelve months, over 1,742 millions of passengers, whose fares amounted to £9,000,000, or just under a penny farthing apiece. The text is written to set forth the various facilities for travel afforded by the agencies of the London Underground Electric Railway Company.

* * *

THE GREAT WESTERN RAILWAY. This volume, included in the "Peeps at Great Railways" series written by Mr. Gordon Home, and published by Messrs. A. & C. Black at 1s. 6d. net, combines information concerning the locomotives, rolling stock, works and train services, with descriptions of scenery and places of interest served by the Great Western Railway. There are eight full-page illustrations in colour and twenty-one small sketches incorporated in the text. While necessarily confined to generalities, the chapters dealing with the history and development of the Great Western system, its locomotives, rolling stock and engineering features, and that describing Swindon Works will be useful to the railway student, while for the less qualified reader a great deal of information is presented in popular form.

"TO THE CONTINENT" is the title of a new booklet, with facsimile water colour illustrations applying to the Harwich Route to the Continent, and issued by the Great Eastern Railway Company. Several of the coloured views are of railway scenes, as well as many of the half-tone illustrations, but the letterpress alone makes the booklet well worthy of preservation. Copies may be obtained free by sending a postcard to the Continental Manager, Great Eastern Railway, Liverpool Street station, London, E.C.

* * *

THE current Tourist Programme of the Cork, Bandon and South Coast Company contains particulars of the "Prince of Wales" route to Glengariff, Parknasilla, Killarney and the lakes and mountains of Kerry, as well as an attractive series of tourist arrangements extending far beyond the actual area covered by the company. Its associations with other railways and with tourist agencies provide many facilities which appeal to the holiday maker, but the Cork, Bandon and South Coast system itself presents a variety of opportunities, covering rail, steamer, motor and coast trips. Copies of the programme may be obtained on application to Mr. J. R. Kerr, General Manager, Cork.

* * *

NEW editions have been issued of the Lancashire and Yorkshire Railway Company's booklets dealing with the Ribble Valley and other pleasure resorts accessible by its trains from the industrial towns of Lancashire and Yorkshire. These are excellent publications, with comprehensive and fully illustrated text. Booklets dealing with the direct express route to the Continent *via* Hull and Zeebrugge are included. Copies of these and other publications may be obtained from Mr. A. Watson, Superintendent of the Line, Victoria station, Manchester.

* * *

SEVERAL booklets issued by the Midland and Great Northern Joint Railway are well produced, with scenic covers in colour and other views in tint, while particulars are given of the various facilities afforded by the system together with fares, lists of hotels and apartments, and other information. One booklet deals with the coast and Broads of Norfolk, and another is entitled "Norfolk Holiday Grounds." Copies can be obtained on application to Mr. J. J. Petrie, Traffic Manager, King's Lynn.

* * *

THE Great Western Railway Company have made another addition to the new series of travel books which have been prepared with the object of encouraging a taste for touring in this country on the part not only of Americans, but of our fellow countrymen residing beyond the seas. An endeavour has been made to unite in as small a space as possible high literary merit with artistic illustration, accompanied by the antiquarian information which now enters so largely into every intelligent itinerary of travel. Copies of the books already published deal with "Wonderful Wessex," "Shakespeare Land," "The Cornish Riviera," and "Devon, the Lovely Land of the 'Mayflower.'" A folded map is included in each volume.

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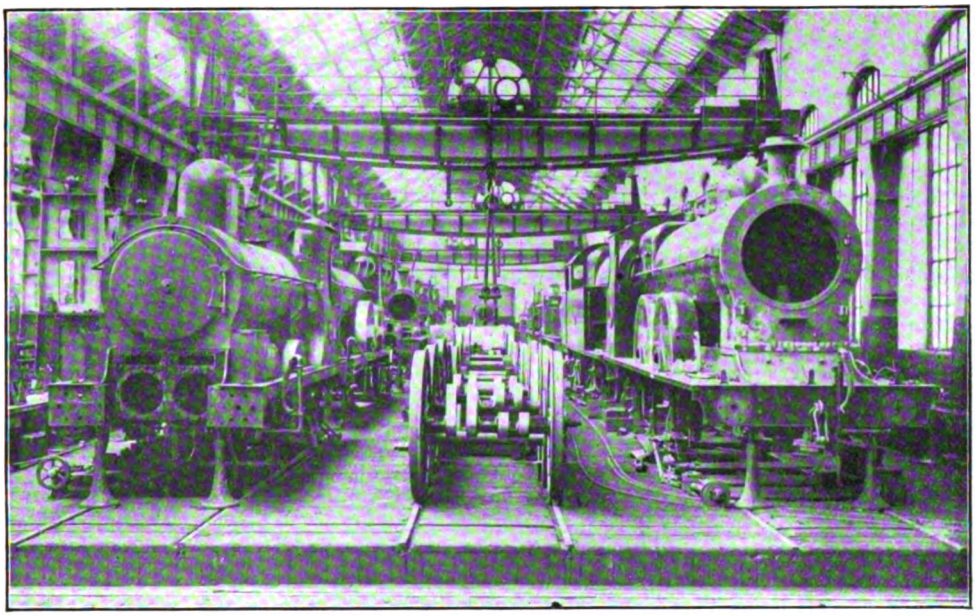

A VIEW IN THE ERECTING SHOP.

The Horwich Works of the Lancashire and Yorkshire Railway.

By J. F. GAIRNS.

PRIOR to 1886 the principal rolling stock repair and maintainance depôts of the Lancashire and Yorkshire Railway were those at Miles Platting and Bury; but these were, at that period, barely sufficient to deal with current work, and it was realised that they would soon be entirely inadequate for growing requirements, while new construction was virtually out of the question. Therefore, in the early "eighties" the directors decided upon the establishment of entirely new premises on a scale which should permit of the concentration of all mechanical engineering work there as well as the construction of new locomotives and other machinery as required by traffic developments.

The site selected was the semi-rural township of Horwich, about a mile from Blackrod station on the main line from Manchester to Preston, and about five miles from the town of Bolton. Previously the place had a population of about 4,000, engaged in cotton bleaching and spinning, firebrick manufacture, etc. By the end of June, 1887, some 116 acres of land had been enclosed, and on these most of the works buildings had been erected and equipped with machinery, while the population had grown to about 14,000. Mr. J. A. F. Aspinall, now General Manager, but then Chief Mechanical Engineer, was mainly responsible for the design and lay-out of the works, and at that date they were recognized as exemplifying up-to-date practice in respect of shop arrangement and equipment, though necessarily many of the machines and much of the material had been brought from the shops at Bury and Miles Platting. It is true that, starting with almost virgin ground, Mr. Aspinall was able to prepare his plans untrammelled by existing buildings and conditions. But he had to consider the future and to arrange the various departments so as to realise good shop and manufacturing efficiency; and it is generally acknowledged that the Horwich Works rank among the best designed shops in the country.

Although described as the Locomotive Works, the plant at Horwich is utilised on

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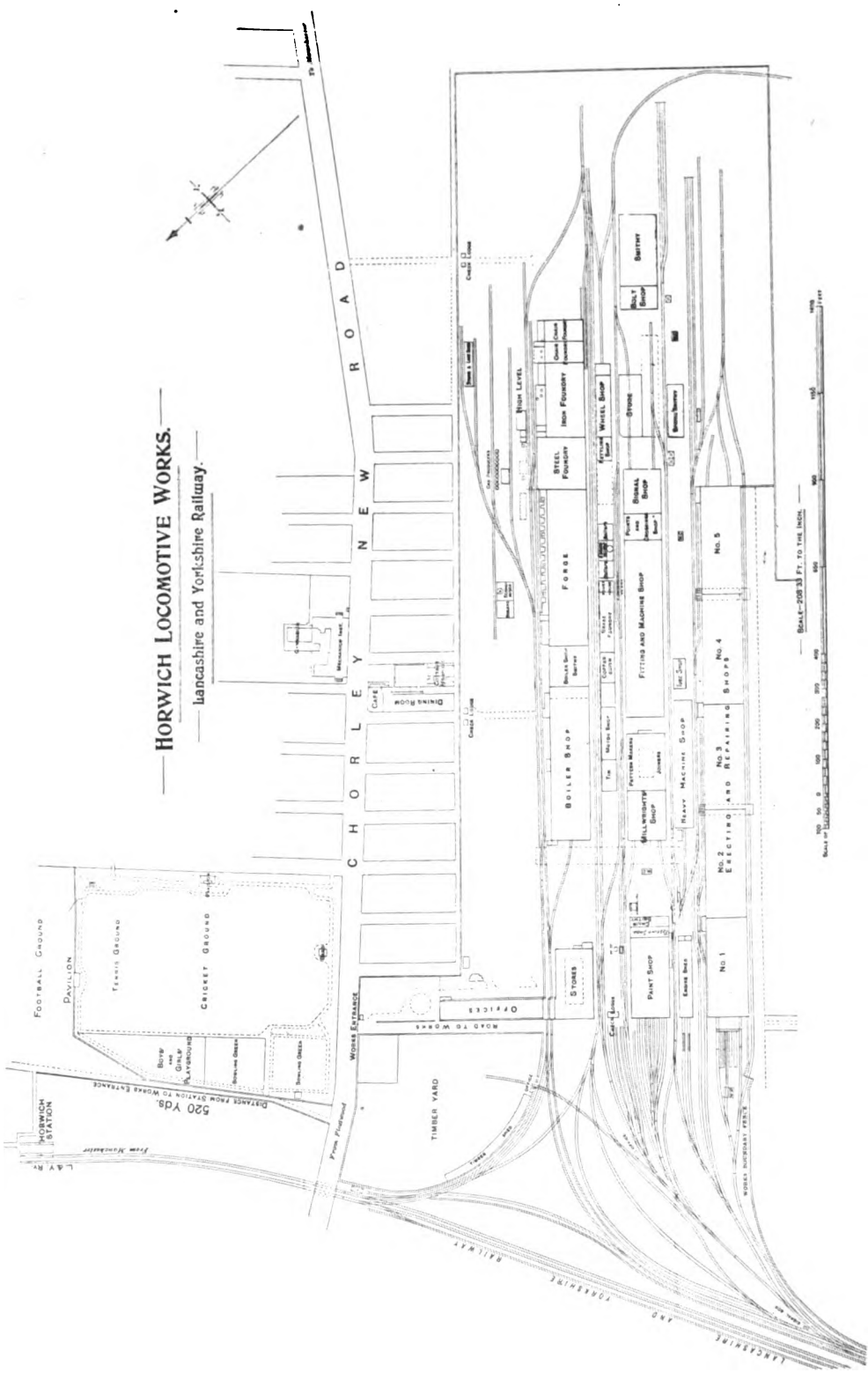

Chorley Old Road

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a much wider basis than the construction and maintenance of locomotive engines. Indeed, the title now borne by Mr. George Hughes, of Chief Mechanical Engineer, best indicates the scope of the department. At Horwich virtually all metal working required by the railway is undertaken. The carriage and wagon shops at Newton Heath are also under Mr. Hughes' control, but most of the metal work—wheels and axles, springs, drawgear, and so on—is prepared at Horwich. Electric machinery, including the construction of motors for the electric trains on the Southport and other divisions, as well as electric cranes and capstans, as employed in the docks and warehouses, is also dealt with at Horwich, though in this section it is sometimes necessary to place orders for new material outside, and where business considerations justify the practice, this is also done with other goods. The large fleet of steamers owned singly or jointly by the Lancashire and Yorkshire Railway also adds to the activities of Horwich, this railway owning a larger number of steamers than any other in the United Kingdom. Permanent way material is machined and built up at Horwich to the order of the engineer's department, while the signal and telegraph shops are reserved for work called for by the signal and telegraph departments. Indeed, it may be said that Horwich has to supply all other departments, as well as serving the needs of the locomotive department itself. As regards the latter, 1,550 locomotives, 5,000 carriages and 35,000 goods vehicles have to be maintained, each year witnessing the construction of a number of new engines, coaches, or wagons to replace old ones or to supply increasing requirements. And in view of the numerous other matters which have to be dealt with at Horwich, it is not surprising that from 3,000-4,000 men and boys are there employed, with another 3,000 or so at Newton Heath and various small depôts. With the enginemen engaged in working traffic and the staff concerned with engines and vehicles in service, Mr. Hughes has control of nearly 12,000 men and boys.

MR. GEORGE HUGHES, M.I.MECH.E.
Chief Mechanical Engineer.

Compactly arranged in parallel lines, the buildings cover 22 acres, 94 acres enclosed between the boundary fences being utilised for stacking and storing material, and to provide space for outdoor operations and traffic movements. In addition, one might almost include the areas on which the staff dining rooms, Mechanic's Institute, and Cottage Hospital are built, together with the cricket and sports grounds, seeing that these have been provided mainly in consequence of the establishment of the works. The plan reproduced on page 90 indicates the main features of the location, and sets forth the railway connections, as well as showing the positions of the various shops and departments. There are several entrances for workmen, but the principal entrance faces directly upon Chorley New Road, opposite the cricket ground.

The office building lies beyond a well-kept lawn, but as it is approached endwise it

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MR. H. E. O'BRIEN,
Assistant Mechanical Engineer and Works Manager, Horwich.

MR. F. E. GOBEY,
Assistant Carriage and Wagon Superintendent, Newton Heath.

MR. F. W. ATTOCK,
Chief Assistant, Outdoor Locomotive Department, Horwich.

MR. J. R. BILLINGTON,
Chief Draughtsman, Horwich.

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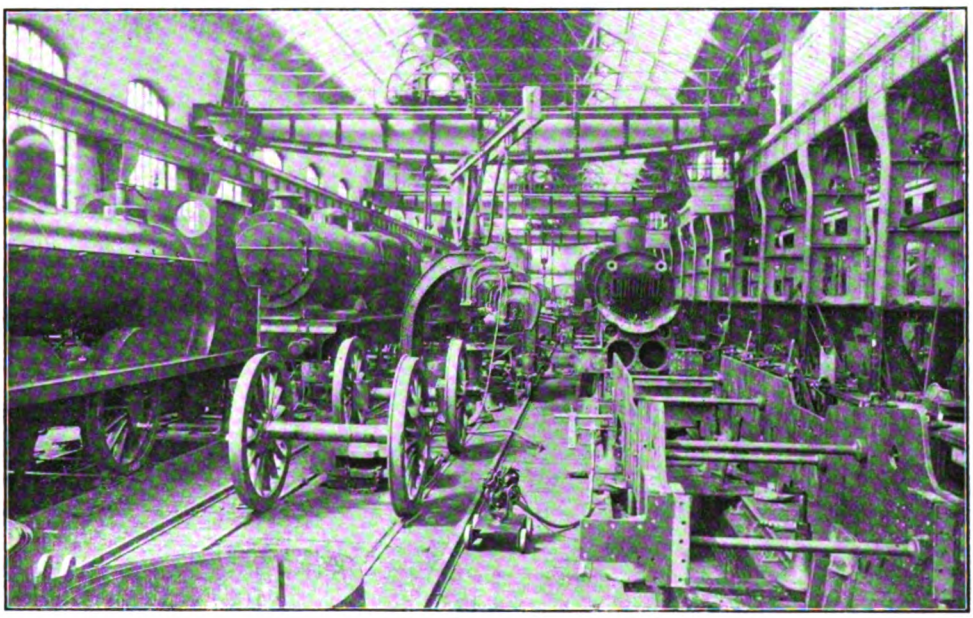
presents a somewhat insignificant appearance. On entering, however, the visitor soon alters his opinion in this respect. Actually it is a building 323 ft. long and 58 ft. wide. On either side of a wide corridor, lighted from above, is a series of rooms, some serving as offices, others as private rooms for Mr. Hughes and his chief assistants, while the drawing office is one long, well-lighted department accommodating about 16 draughtsmen and tracers. A laboratory, fitted with testing machines and with a chemical section, is also provided. Electric lighting is employed throughout the office and works. In the drawing office suspended incandescent lamps are supplemented by reflected illumination from arc lamps shielded from direct vision, the ceiling and walls being painted white to obtain the desired result. Connected directly to the office building is the general store—a building 198 ft. long and 111 ft. wide, with a gallery built round the four sides. Weighing machines, hydraulic cranes, and other appliances are installed.

In line with the stores is the first row of buildings, and these may be followed in order. Outside the end of the boiler shop the yard is spanned by a long gantry extending into the uncovered area to the left. This gantry has recently been fitted with an electric overhead crane instead of the steam installation previously provided. It serves for moving boilers outside the shop as required, and for conveying materials to right and left of the boiler shop. Another gantry of the same kind, but still fitted with a steam crane, serves the yard between the signal shop and smithy. Otherwise inter-shop transportation is usually effected by means of a system of narrow-gauge railways aggregating some 7½ miles of 18-inch gauge line. Small locomotives are used for this purpose, one of which is illustrated on another page. They have 5 in. by 6 in. cylinders, 16 in. coupled wheels, frames are 7 ft. 4 in. long, extreme width is 3 ft., steam pressure is 200 lbs. per sq. in., and weight in working order is 3·57 tons. About 12½ miles of standard gauge railway also extend throughout the works, partly for transportation and partly for storage.



ANOTHER VIEW IN THE ERECTING SHOP.

The boiler shop is 439 ft. long and 111 ft. wide. It contains three bays. Two are reserved for machine tools. The left-hand section is mainly reserved for erecting boilers, pits being provided at intervals, so that boilers can be lowered below ground level to facilitate work on the parts which may be uppermost. The bays are formed by two rows of cast iron columns supporting the longitudinal roof gables. Girders along the outer walls above the side windows form tracks for overhead cranes, with shop

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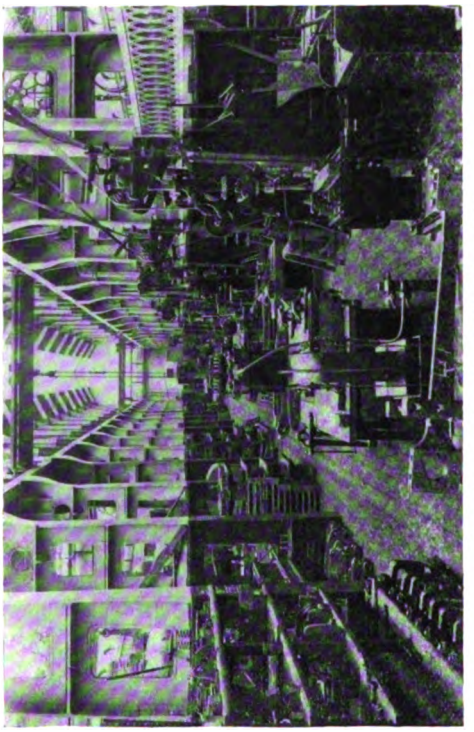
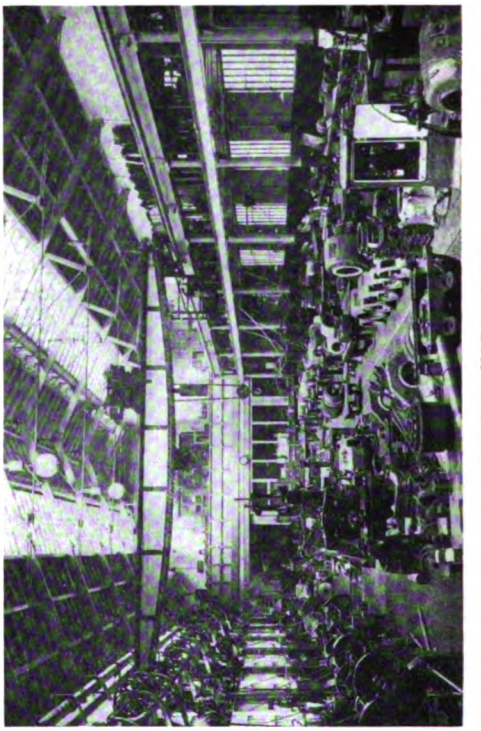
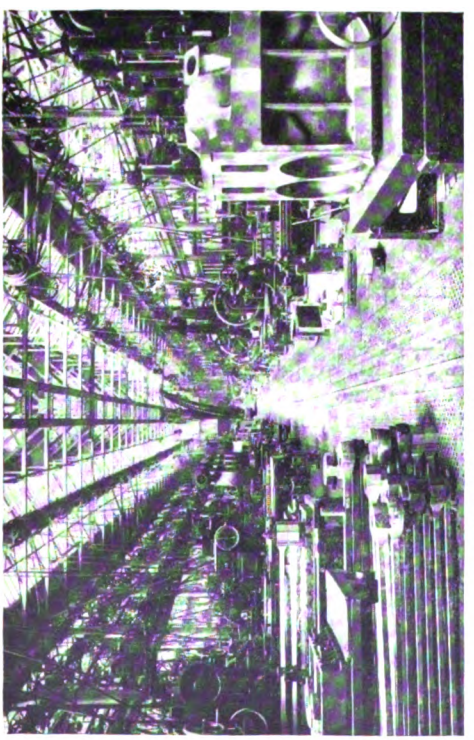


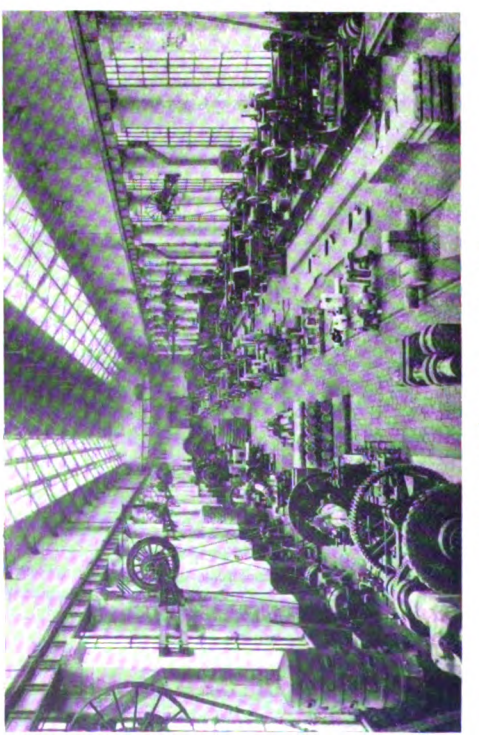
AN ARCADE IN THE ERECTING SHOP.



ELECTRIC MOTOR SHOP.



ANOTHER VIEW IN THE MACHINE SHOP.



FRAME AND CRANK AXLE SHOP.

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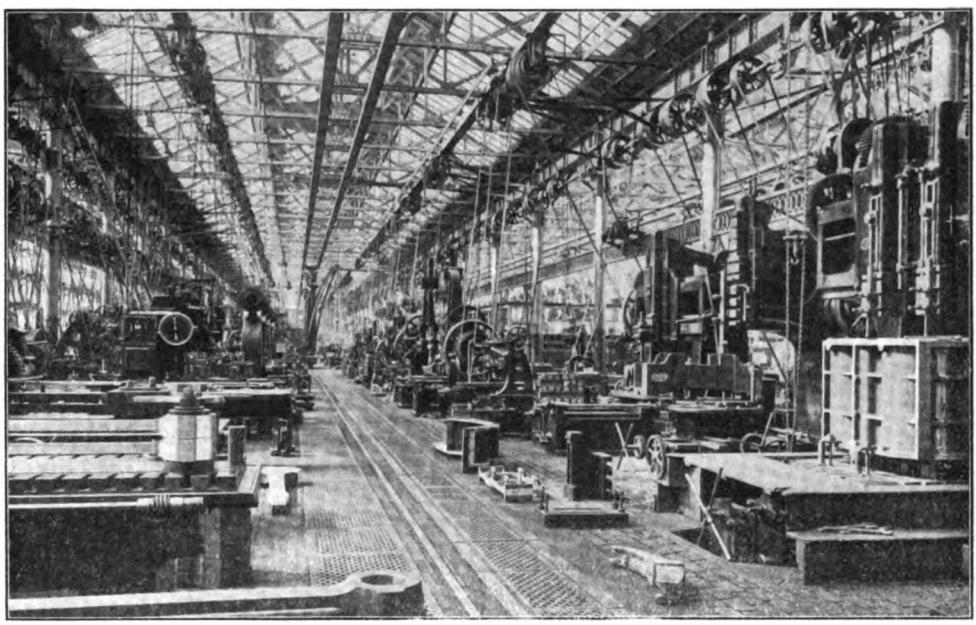
shafting below, while the roof columns similarly carry girders for the cranes and brackets for shafting. Most of the buildings are arranged more or less on these lines, so that detailed reference in each case is unnecessary. As a rule, the shop shafting is operated by electric motors, supplied with current from the works power station, and the overhead cranes are electrically driven. There are, however, numerous wall cranes in all departments, and except the smaller ones, which are hand-operated, most of these are worked by hydraulic power. Along the left-hand bay of the boiler shop a number of planing machines may be noted, but, as already indicated, this is mainly reserved for erecting boilers on the various pits or stands. At the end of the shop there are two Tweddell rivetting towers designed by Messrs. Fielding & Platt. These will each suspend a standard boiler on end, so that the hydraulic rivetters can act upon almost any desired part. There are also three portable hydraulic rivetters on swing frames. Alongside, in a corner of the shop, is the hydraulic accumulator, supplying water pressure at 2,000 lbs. per sq. in. The pump for this is driven by an electric motor. At the other end of the shop is an air compressor supplying the numerous pneumatic tools employed.

Among the various machines and tools used in the erecting section may be specifically mentioned a pneumatic rivetter by Ross, of Glasgow, for rivetting over the heads of copper firebox stays. This is swung from a hand crane, so that the tool can be brought to bear upon any position. The tool head is then swung round so as to form a good head upon the end of each stay by a combination rolling and rivetting action. Another useful appliance, shown in one of the photographs, is a quadruple tapping machine, rope-driven, adapted to be suspended within an inverted firebox as indicated, and designed by Mr. Aspinall. Along the centre bay may be noted several punching and shearing machines; a Noble & Lund horizontal band saw for cutting the edges of throat plates and the like; edge planers, plate rolls, including new rolls adapted for plates up to 11 ft. wide; flange drills, and two formers for bending firebox wrapper plates to shape. The right-hand bay contains mainly drilling machines, radial arm drills being especially favoured. Two new Asquith machines for drilling firebox plates, a horizontal multiple drill by Cravens, capable of taking five or six plates together, two Craven vertical multiple drills, and other drills by Cravens, Muir, and other makers may be noted. There are also several long plate edge planers, lathes, slotters, planers, stay tapping and other



ONE OF THE MACHINE SHOP BAYS.

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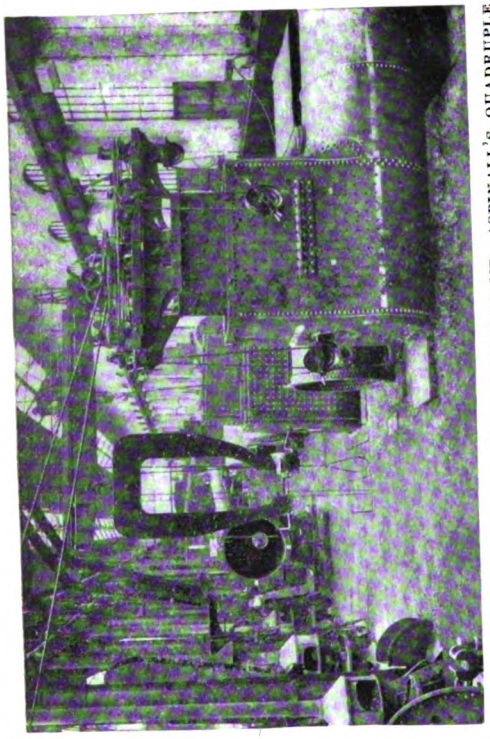
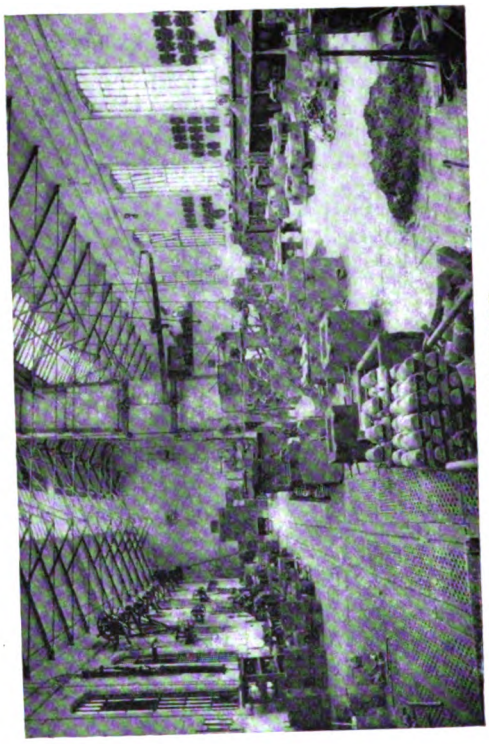
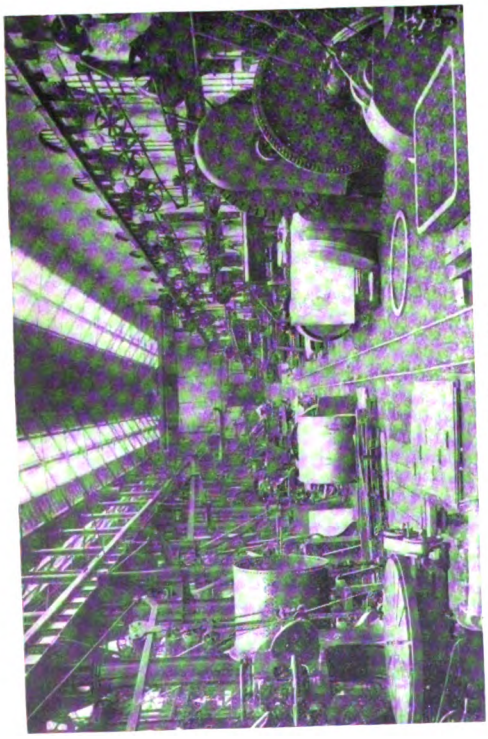


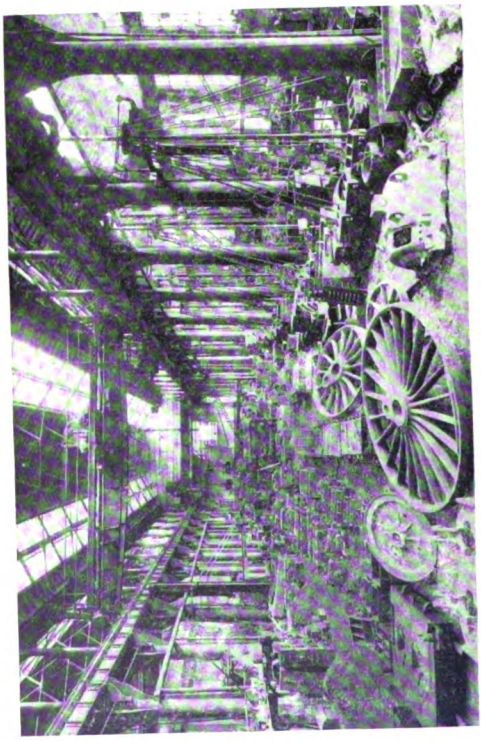
A CORNER OF THE BOILER SHOP, SHOWING MR. ASPINALL'S QUADRUPLE TAPPING MACHINE.



BRASS FOUNDRY.



BOILER SHOP.



STEEL FOUNDRY.

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tools, with a Craven vertical miller as a recent addition.

Adjacent to the boiler shop is the boiler shop smithy, 120 ft. long. Here is the big hydraulic press, by which throat plates and firebox sheets of mild steel, or tube plates of copper, are pressed and flanged to shape. The photograph on another page indicates the scope of work of this machine, various specimens in later stages of manufacture being shown alongside. On either side is a gas furnace for heating the blanks. These two furnaces also serve a press on the other side used for shaping gear cases for the electric motors and for various other requirements, as well as smaller presses and devices for shaping details, flanging and so on. A useful device is one for bending angle irons cold to form square corners without cutting. The big presses operate usually in two stages. When making copper tube plates the blanks are flanged cold, and afterwards annealed and finished. The large presses and the angle iron bending machines are by Fielding & Platt, of Gloucester. Several steam hammers, smith's furnaces, cranes and various appliances complete the equipment of this section.

Beyond the smithy is the forge, a building 452 ft. long and 111 ft. wide. This contains a series of Siemens regenerative furnaces for re-heating and an annealing furnace, together with steam hammers and special machines. They include a big tyre mill by P. R. Jackson, operated by a large two-cylinder steam engine by Walker, of Wigan. This is adapted to roll tyres of any size up to 7 ft. 3 in. diameter from the hot billet. A big shearing machine by Fairbairn, Naylor & MacPherson, operated by its own engine, is supplied for cutting scrap metal, and will shear almost any thickness. The hammers include a 35-ton duplex design, by Thwaites, of Bradford, together with one 8-ton (Tannett, Walker & Co., of Leeds), and two 5-ton hammers, by B. & T. Massey, of Openshaw. A 14-inch Merchant mill, an 8½-inch guide mill, and a 30-inch cogging mill with electrically driven live rolls are also provided in this shop. The forge furnaces are heated by gas supplied by 16 Wilson producers.

Next comes the steel foundry, a building 150 ft. long and 135 ft. wide, the iron foundry (212 ft. long and 111 ft. wide), and chair and plate foundry (124 ft. long and 128 ft. wide) completing this range of shops. Siemens-Martin regenerative melting furnaces are arranged at one side of the steel foundry, and supplied with gas from nine Wilson producers. A high level tramway, electrically operated, is used for carrying the ladles. The iron foundry is served by two cupolas, while two others supply the chair foundry. These are arranged at one side adjacent to the gas producers and convenient for charging, ash-removing, and other operations from the outside. Machine moulding is largely adopted, and is practised for nearly all repetition work. This foundry and the iron foundry adjacent contain a large number of such devices. As regards wheels, centres up to 5 ft. 9 in. diameter are made this way, so that it is only 7 ft. 3 in. engine wheels (6 ft. 9 in. centres) which have to be moulded otherwise.

Hydraulic power is used for most of the cranes in these shops, with an overhead electric travelling crane serving both the steel and iron foundries. In the iron foundry four revolving moulding machines or "roundabouts" are installed. These can be seen in the photograph of this shop reproduced on another page. In making buffer moulds and like parts, ramming and jarring devices are used to consolidate the moulding sand and ensure good casts. Revolving core drying machines, riddling machines for sand, chilled moulds for making firebars, may also be mentioned. In the chair foundry the outlet from each cupola is fitted with a tilting mouthpiece so that metal can run continuously, being tilted from side to side as ladles are filled and replaced empty. At the end of the chair foundry a staging is erected for fettling the chairs, which are then placed on an endless chain to convey them to railway wagons for despatch. To the left of this range of buildings, reckoning from the offices, the ground rises towards the chair foundry, and this fact is utilised to allow of coke and iron being unloaded and wheeled direct to the charge holes of the cupolas and furnaces. Similarly the gas producers are charged direct at the top, the ashes being drawn out at the bottom into low level tram wagons. The boilers for the forge hammers are located as shown.

The next row of buildings have a uniform width of 47 ft., in three sections. The tinsmith's shop is 92 ft. long, and contains tools and plant for miscellaneous requirements. Machines in this shop are partly driven from the adjoining motor shop and partly by a 7 horse-power motor specially installed. The motor shop is 153 ft. long. Here the plant used on the Southport and other electric services from Liverpool is

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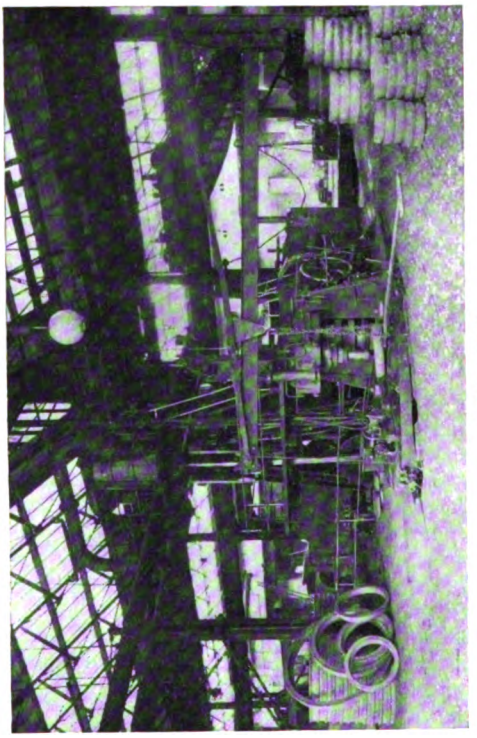
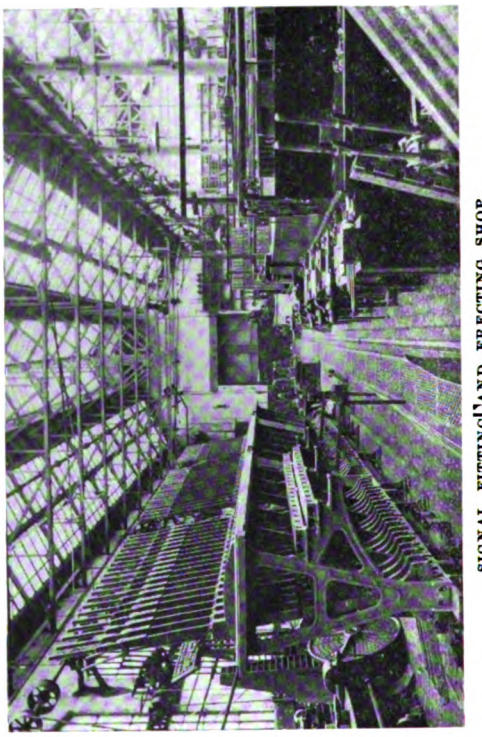
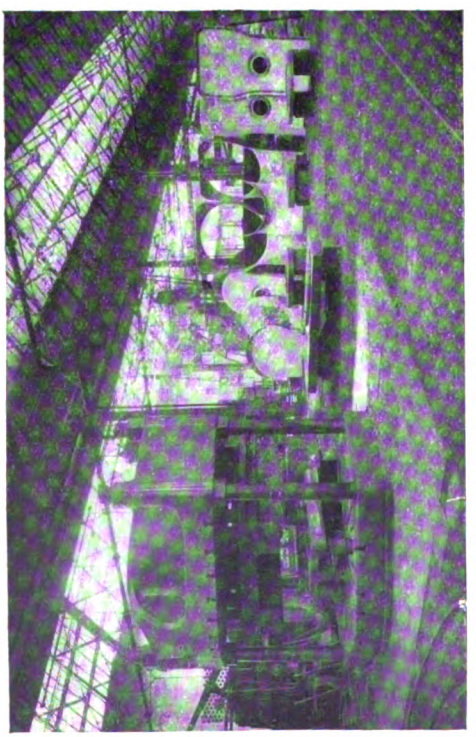


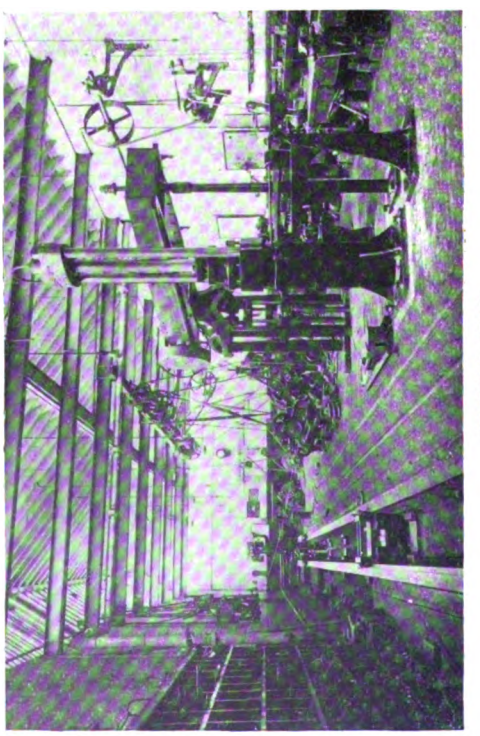
TYRE MILL.



SIGNAL FITTING AND ERECTING SHOP.



THE BIG HYDRAULIC FLANGING PRESS.



TESTING SHOP.

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overhauled and repaired as far as the motors are concerned, while new motors are also erected, wound and fitted here. This department also deals with electric motors and appliances connected with electric cranes, traversers and capstans used about the system as well as at Horwich. The shop is run by nine motors, varying from 3 to 5 horse-power. A space between the motor shop and the coppersmiths' shop is utilised as a case-hardening department.

The coppersmiths' shop is 89 ft. long, and adjoining this is the brass foundry, 164 ft. long. The latter is fitted with gas melting furnaces for heavy work and with coke fired Morgan tilting crucible furnaces for lighter casts. A special core-drying stove is heated by waste gases from the crucible furnaces. At the end is the power-house, from which all the current required for power and lighting in the works is supplied. This section is 32 ft. long and contains one 800-kilowatt horizontal mixed-pressure British Thompson-Houston Curtis turbo-alternator set, working in conjunction with a 750-kilowatt rotary convertor supplying current at 250 volts, and supplied with exhaust steam from hammers in the forge and smithy; two 300-kilowatt Bellis & Morcom high-speed engines and dynamos, and two small 60-kilowatt sets. Adjoining the power station is a Mirlees-Watson barometric condenser.

Boilers for the power-house are arranged in two sets in an adjoining building, with "Green's" Economisers between. Lancashire boilers are used, some fitted with underfeed mechanical stokers, others with forced draught grates for burning inferior fuels. A little further along, continuing the alignment of the departments just reviewed, are the fettling and wheel shops. In the former pneumatic tools are largely used for dressing castings. The wheel shop is 200 ft. long. It is fitted with lathes for boring and turning carriage and wagon wheels (90 pairs of wagon wheels complete going through at the same time), hydraulic presses for forcing tyres on wheels and for forcing wheels on axles, single and multiple drills for various purposes. The shop shafting on either side is driven from a 20 horse-power and a 30 horse-power motor mounted overhead.

The third row of buildings commences opposite the general stores with the paint shop, the standard width of this series of shops being again 111 ft. Steam heated and equipped with paint-grinding and mixing machines, the paint shop is 234 ft. long, with eight lines of rail. In order to avoid sun glare, the roof is of weaving-shed type. The adjoining testing shop (27 ft. long) and chain smithy (28 ft. long) are fitted with a 100-ton hydraulic testing machine, a 100-ton hydraulic chain testing machine, and oil and spring testing appliances, all of Wicksteed design, constructed by Buckton & Co., of Leeds. There are also machines for preparing test specimens and a steam hammer. Outside the chain smithy is a chain annealing furnace. Across the yard, beyond the boiler shop gantry, previously referred to, is the millwrights' shop. This is devoted mainly to general work not covered by other departments. Cranes, capstans and hydraulic machinery are here dealt with. This shop is 143 ft. long, and is served by three overhead electric cranes. An assortment of suitable machines is here installed, operated by four electric motors. Next is the pattern makers' and joiners' shop. This is 164 ft. long and is provided with a gallery all round for storing patterns. A special pattern-making machine by Wadkin & Co., of Leicester, enables many of the less straightforward shaping operations to be easily and accurately effected. Two sand-papering machines—one having a vertically revolving disc, the other a vertically moving band—facilitate finishing operations, and also assist the shaping of small parts. Automatic saw-sharpening machines, one for band saws, the other for circular saws, enable the sawing equipment to be kept in order. Various wood-working machines are also installed, while several Oliver trimmers render useful service. An automatic sprinkler system is supplied to this shop in case of fire.

The main fitting and machine shop now calls for attention. This is 508 ft. long and 111 ft. wide. Here two large wall engines (the boilers being within a few feet) at one end on either side drive four ranges of longitudinal shafting by means of bevel gearing. In addition, several machines are directly driven by electric motors, there being 14 in this shop for various purposes, varying from 1½ to 20 horse-power. There are three bays, the central and right-hand bays being each served by two 5-ton electric walking cranes. On entering the shop from the pattern-makers' department three enclosures may be noted. On the left is the tool room for tools and gauges. Two grinders are here installed. Beyond this is the high-speed steel tool section. Here are small

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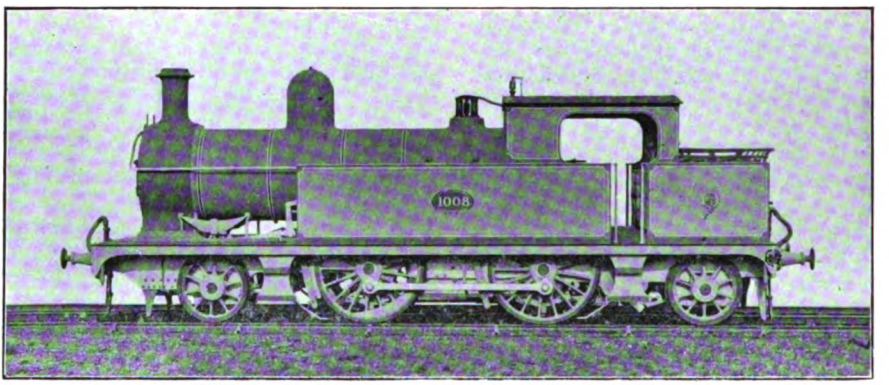
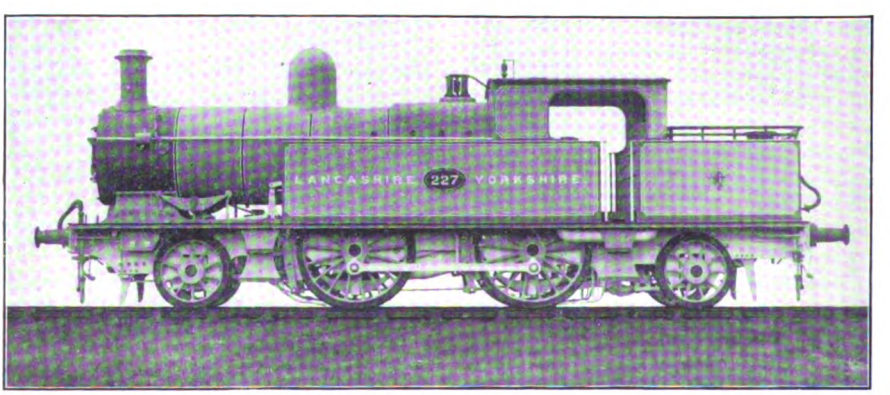


THE FIRST ENGINE BUILT AT HORWICH WORKS.
The Pioneer of Mr. Aspinall's Famous 2–4–2 Tank Engine Class.

case-hardening furnaces, a rock salt bath, linseed oil tempering bath, a tool grinder and other appliances for dealing with drills and cutters of case-hardened high-speed steel. On the right-hand side is the tool shop, where tools, gauges, templates and the like are constructed, a suitable assortment of machines and appliances being provided.

Returning to the left-hand bay, a group of fitters' benches may be noted alongside the high-speed tool section. Beyond, the space is mainly devoted to planing and shaping machines, a large number of which, by various makers, are here installed. Among other machines may be noted a Webster & Bennett four-spindle boring machine, and two Tasker machines for grinding the faces of axle boxes and slide valves instead of planing them. Many of the planing machines are of duplex type, and of such recent designs as Buckton's, Bateman's, and others. The central bay contains a useful assortment of machines, though only a few need be noted in detail. At the further end are two large cylinder boring machines by Cravens, both adapted for boring two cylinders and two piston valve liners simultaneously. A special large diameter miller serves for milling saddle castings for supporting smoke-boxes. Duplex and other boring, planing and slotting machines are also fitted here for machining cylinder castings. On the other side of the central aisle several machines may be mentioned specifically, including mainly milling and automatic machines. A large planer by Muir & Co., and profile machines by the same firm for milling connecting and coupling rods according to template, attract special attention. A series of vertical and horizontal milling machines of various types and designs are supplied by Muir & Co., Smith & Coventry, Alfred Herbert and other makers, and indicate the fact that at Horwich milling is largely followed and practised. Then comes a series of radial drills by G. & A. Harvey, Muir & Co., Hulse & Co., Smith & Coventry, Asquith and other makers, another class of machine highly favoured at Horwich. Messrs. Hulse & Co.



ONE OF MR. HUGHES' LATEST 2–4–2 TANK ENGINES, FITTED WITH SCHMIDT SUPERHEATER.

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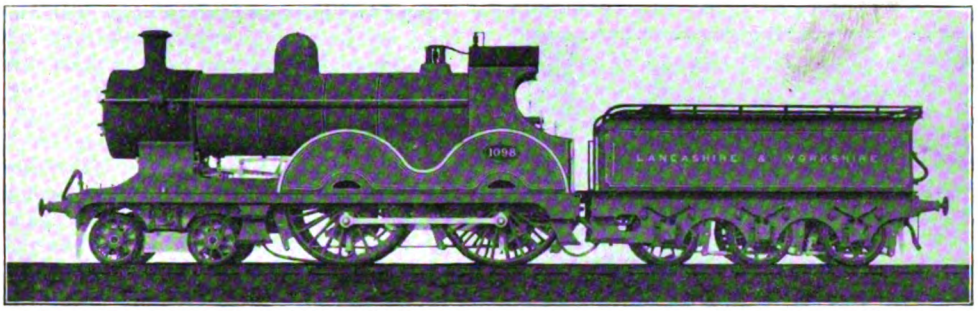


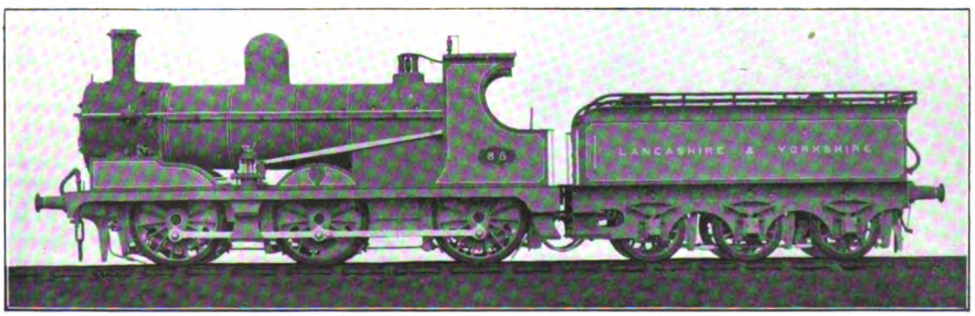
ONE OF MR. ASPINALL'S 4–4–0 LOCOMOTIVES REBUILT WITH SCHMIDT SUPERHEATER AND INSIDE WALSCHAERT VALVE GEAR BY MR. HUGHES.

supply a four-spindle boring mill. A group of automatic stud-making machines necessarily attracts special attention, especially as some of the tools are new ones. Most of them are by Alfred Herbert, and some of the Gridley type by Craven.

A gear-cutting machine by Darling & Sellars is utilised for cutting spur wheels as used for electric motors on the electrified sections of the line. A Holroyd screw and worm milling machine is used specially for making the reversing screws of locomotives. A further series of automatic machines for making copper firebox stays may then be noted, these being of Herbert design. Screwing and tapping machines, and boring, slotting and other machines, complete the equipment of this section. A device consisting of double eccentric grinding discs for lapping out holes in gear rods and the like is of special interest. The right-hand bay contains a number of big lathes for wheels and axles, numerous small lathes, a group of brass working machines, and several special machines. Wilkinson single head, and Webster & Bennett double head, vertical boring machines enable various operations to be carried on. Capstan lathes by Alfred Herbert, Pollock & MacNab, and other makers, including American designs, are also installed here. The section nearest the tool shop is equipped with fitters' benches, and a section further along serves for the erection and fitting of injectors, pumps and other details.

The points' and crossings' shop beyond is 72 ft. long, and contains various angle planing machines, duplex slotting machines, with milling and other tools as required. The signal shop is 128 ft. long and adapted for fitting up locking frames and general signal work, with a few tools for wood working as required for constructing and preparing signal cabins and signal posts. Further along, but in the same alignment, are the general smithy and the smithy bolt shop. The latter is 60 ft. long, and contains various bolt and nut-making machines, drop stamps (three Rollo, 12 cwt., one steam, 5 cwt.), a large Ajax forging machine, and several Bradley hammers. The furnaces in this shop are heated in some cases with liquid fuel, in others with coke. The adjoining smithy is 212 ft. long. It contains 11 double and 26 single hearths, 9 steam hammers, 8 drop stamps (three Brett's 20-cwt. steam, one Brett's 30-cwt. steam, and four "Rollo" 12 cwt.), and a Root's blower for the blast.

The fourth row of buildings is of a miscellaneous character, and is exceptional in that no two shops have the same width. Alongside the paint shop is the engine shed. Then



MR. HUGHES' STANDARD GOODS ENGINE FITTED WITH SCHMIDT SUPERHEATER.

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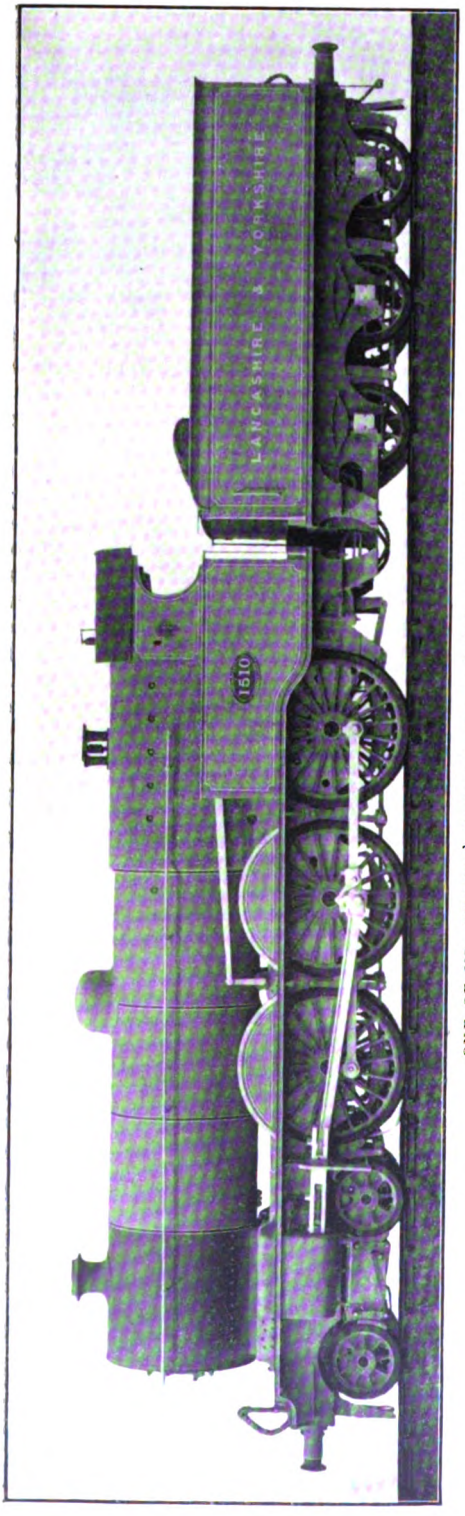

ONE OF MR. HUGHES' FOUR-CYLINDER 4–6–0 LOCOMOTIVES.

comes the heavy machine shop, 360 ft. long and 48 ft. wide, containing straightening, slotting and radial arm drilling machines for frame plates, crank pin boring, keyway milling and slotting machines, plant for making built-up crank axles, crank axle, straight axle and large wheel lathes, and a number of specially constructed machines. Among the makers represented may be mentioned Messrs. Tangye, Fairbairn, MacPherson, Hetherington, and Cravens. All the machines in this section are individually driven by three-phase alternating-current motors, made by Schuckert, and the first installation on this system. In the adjacent tube shop, 82 ft. long and 35 ft. wide, machines are installed for cutting and piecing ends, and otherwise dealing with tubes. The oxy-acetylene process is exclusively utilised for welding up pit holes in tubes. A rattler serves for cleaning tubes. The only other shop in this row, some distance removed, is the spring smithy. This is 153 ft. long and 47 ft. wide. It is fitted with three gas-heated spring furnaces, a hydraulic spring buckle press, a buckle stripping machine, and a steam hammer. There is also a self-contained plant for making spring plates, comprising electrically-driven punching, nibbing and shearing machines.

Only one other building now calls for attention, but this is by far the largest. The erecting shop is no less than 1,520 ft. long and 118 ft. wide. It comprises actually five divisions, but all are open throughout, although fireproof arrangements are provided. It is formed with two main bays, and a narrow central bay all extending from end to end. Access is obtained by means of two electric traversers as well as from the ends, and no fewer than twenty 30-ton electric overhead cranes by Hetherington's, of Manchester, are installed in the two principal bays. As a rule an engine is brought in by a traverser or from one end, according to where it is to be placed, and is then lifted by two cranes and carried over the central line of the side bay, thence to be transferred to the desired position on one of the side lines. The central lines are reserved for wheels, so that an engine can easily be carried over them. The middle bay contains various tools, so that machining can be done adjacent to engines in for repair, while at the same time the main bays are kept clear. Portable pneumatic rivetters, motor-driven flexible shaft drilling machines and other tools and appliances are plentifully provided.

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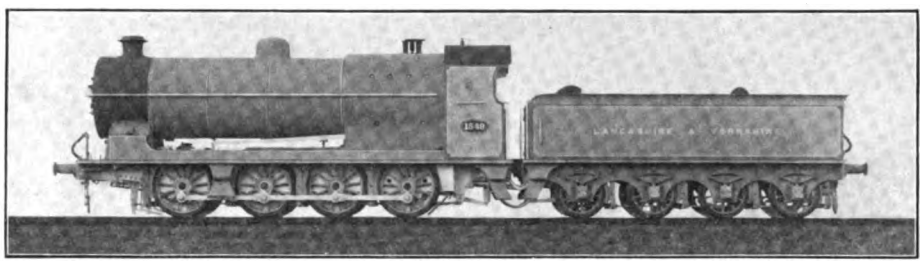
Portable cylinder boring machines are also employed. Outside the erecting shop are two covered stands adapted for steaming boilers, each having an adjustable smoke-box, ash pit, etc.

While expressing indebtedness to the courtesy of Mr. G. Hughes for facilities connected with my visit to Horwich Works, and to Mr. Gass for his valuable services as guide, reference may be made to the Mechanic's Institute and other associations attached to the Locomotive Works. The Mechanic's Institute and Technical School, Horwich, was opened in December, 1888, four science classes being then in operation, with an average weekly attendance of 90 students. New reading and smoke rooms and library, with a public hall having seating capacity for 900 persons, and metallurgical and other technical class rooms, were added to the original building, and opened in July, 1893. The accomplishment of this work was mainly due to the efforts of Mr. Aspinall, and the gift of the "Samuel Fielden Wing" by the late Mrs. Samuel Fielden, of Todmorden, in memory of her husband, who for many years was a director of the railway. It is entirely self-supporting. In the winter session 20 distinct subjects are being taught by 21 certificated teachers, with an attendance of 527 individual students. Prizes are provided by the committee of the institute and by several public bodies throughout the country, as well as by private donors, and these are awarded after the students have sat at competitive examinations, covering in detail the subjects taught during the session.

There are 2,224 members connected with the Institute. Affiliated with the Institute are engineering and photographic societies—an ambulance corps, and cricket, tennis, football, and chess and draughts clubs. The library now consists of 10,143 volumes, with a daily issue of 78 books. The metallurgical, mechanical, electrical and chemical laboratories and other class-rooms are fitted with models and apparatus purchased from the Institute funds, supplemented by special grants of money from the Science and Art Department, the Lancashire County Council and private donors. Having a large public hall, and to provide healthy entertainments for its members and students, the committee have fitted up the hall as a theatre.



NEW SUPERHEATER MINERAL LOCOMOTIVE DESIGNED BY MR. G. HUGHES.

The design is a development of the larger engines of this class already in service, with a Belpaire firebox of enormous proportions, and fitted with Mr. Hughes' arrangement of superheating apparatus. Leading dimensions are as follows :—

Cylinders : 21½ in. by 26 in.
Wheels : 4 ft. 6 in.
Wheelbase : 16 ft. 4 in.
Total weight : 66 tons 11 cwt. 2 qrs.
Boiler—Diameter : 5 ft. 8¼ in.
Length between tube plates : 14 ft. 8 in.
Heating surface :
Tubes : 1,823 sq. ft.
Firebox : 195 sq. ft.
Superheater : 302 sq. ft.
Firegrate : 25·5 sq. ft.
Tender—Loaded : 42 tons.
Tank—Gallons : 3,600.

About 11 acres of land were placed by the Lancashire and Yorkshire Railway Company at the disposal of the Institute Committee, and through the generous assistance of two of the directors (Mr. H. Y. Thompson, and the late Mr. W. Himmers) the land has been laid out as a recreation, bowling, tennis, and cricket ground. Other land has been obtained and equipped as a football ground. With a view to the development of physical indoor exercises among the students during the winter months, the kind donor of the "Samuel Fielden Wing" (the late Mrs. Samuel Fielden, of Todmorden) built and endowed a covered gymnasium in connection with the Institute. The Fielden Gymnasium was opened in October, 1895, and has a membership of 253. Prior to the establishment

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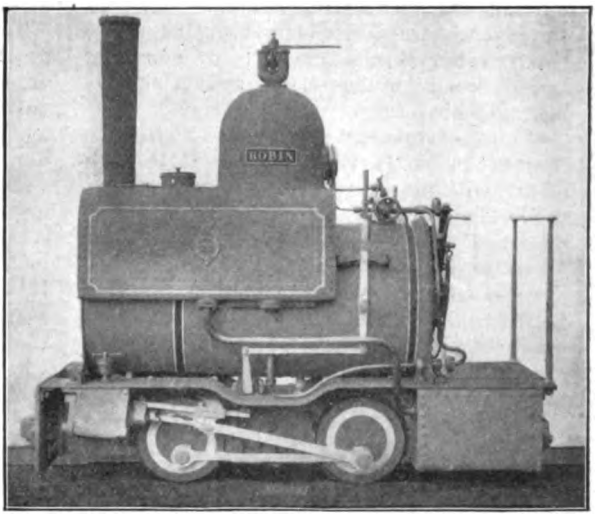
of the Mechanical Engineering Works of the Lancashire and Yorkshire Railway at Horwich, in 1886, the population of that township was under 4,000, while it is now 16,000. For the treatment of accidents that may occur in the works, a Cottage Hospital has generously been provided at the cost of Mr. H. Y. Thompson. Dining rooms have been erected near the Cottage Hospital for the accommodation of men living at a distance. About 1,100 men can be supplied, attendants being in charge for the purpose of heating and cooking meals brought by the men. A café attached serves for the sale of prepared meals to clerks and others who cannot get to their homes in the allotted time.



ONE OF THE NARROW GAUGE TRAMWAY ENGINES USED FOR TRANSPORTATION ABOUT THE WORKS.

Mr. George Hughes, who has held the position of Chief Mechanical Engineer of the Lancashire and Yorkshire Railway since March, 1904, received his early education at the Norfolk County School (1880–1882), after which he became a Premium Apprentice under the late Mr. F. W. Webb at the London and North Western Railway Works at Crewe. From 1887 to 1888 Mr. Hughes was employed in the millwright shop at the Horwich Works of the Lancashire and Yorkshire Railway. He was afterwards in charge of the Testing Department and Inspector of purchased material for the Chief Mechanical Engineer's Department, and in 1894 was appointed as Assistant in the Outdoor Locomotive Department, afterwards taking charge of the Horwich Gas Works and the general gas lighting of the Lancashire and Yorkshire Railway system. In 1895 Mr. Hughes was appointed Chief Assistant in the Carriage and Wagon Department at Newton Heath, Manchester. In 1899 he became Principal Assistant to the Chief Mechanical Engineer at Horwich, and Manager of the Locomotive Engineering Works there, holding that position until selected by the Directors to succeed Mr. H. A. Hoy in charge of the whole of the Chief Mechanical Engineer's Department. He is the author of a book on "The Construction of the Modern Locomotives," published by Spon; and has contributed several extremely valuable papers on practical locomotive and engineering subjects to the Institution of Mechanical Engineers and other kindred associations. Mr. Hughes is a member of the Institution of Civil Engineers, and of the Iron and Steel Institute; and a member of the Councils of the Institution of Mechanical Engineers, and the Institute of Metals.

Mr. H. E. O'Brien was educated at Eton and the Victoria University, Leeds. He received his engineering training with Messrs. Kitson & Co., Airedale Foundry, Leeds, on the Dublin and South Eastern Railway as a pupil of Mr. R. Cronin, and finally at Horwich as a pupil of Mr. Aspinall. After experience in several Departments of the Lancashire and Yorkshire Railway, he was appointed in 1903 Engineer for Electric Traction, and took charge of the electrification of the Liverpool and Southport line, where he was responsible to the Chief Mechanical Engineer for the operation and upkeep of the power house, sub-stations, track equipment and rolling stock. In 1909 Mr. O'Brien was appointed Carriage and Wagon Superintendent at Newton Heath, and in 1910, on the promotion of Mr. J. P. Crouch (now Chief Mechanical Engineer of the Central Argentine Railway) to Passenger Superintendent of the Lancashire and Yorkshire, Mr. O'Brien was appointed to the position he now holds of Assistant Mechanical Engineer and Works Manager at Horwich. Mr. O'Brien has at various times visited America, Switzerland and Germany on behalf of his Company to study electric traction and works methods in those countries. He was a delegate to the International Railway Congress of 1910, is an Associate Member of the Institute of Civil

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Engineers and of the Institute of Electrical Engineers, and the author of several papers on electric traction.

Mr. Francis Edward Gobey, M.I.Mech.E., is the Assistant Carriage and Wagon Superintendent to Mr. George Hughes, and has charge of the Newton Heath Works where the carriages, wagons and road vehicles of the Company are built and repaired, as also the various repair depôts and gas works spread over the Lancashire and Yorkshire system. Mr. Gobey entered the service of the Gloucester Railway Carriage & Wagon Co., Ltd., in August, 1889, passing through the various sections of the business, including the drawing office, estimating, accounts, and Works Manager's Departments, and subsequently obtaining, in 1897, an appointment as draughtsman with the Lancashire and Yorkshire Railway at Newton Heath when Mr. Hughes was in charge of that department. Between 1901 and 1903 he acted as assistant in the same works, and in the latter year was appointed Chief Draughtsman. In June, 1909, he became Works Manager, and in the following year succeeded Mr. O'Brien as Assistant Carriage and Wagon Superintendent. Mr. Gobey was educated privately and at Sir Thomas Rich's School, Gloucester, where he obtained a Foundation Scholarship, and was Queen's Prizeman in Mathematics in 1889. Subsequently he studied at the School of Science and Art, Gloucester, and at the Municipal School of Technology, Manchester. In 1899 he was Honours Silver Medallist in "Railway Carriage and Wagon Building" under the City and Guilds of London Institute, being placed First in all England. Mr. Gobey lectured on this subject for the Municipal School of Technology from 1900 to 1908 and in "Railway Economics" at the University of Manchester in 1911.

Mr. F. W. Attock is the Chief Assistant in the Outdoor Locomotive Department, in which position he has charge of a staff of 6,000 engaged in the operation and repairs of the 1,550 locomotives owned by the Company. He entered the service of the Company in 1896, and has occupied various positions in the Outdoor Locomotive Department. He was appointed Outdoor Assistant in the Carriage and Wagon Department in 1904, and in 1905 Assistant in the Outdoor Locomotive Department, then in charge of Mr. A. D. Jones. In April, 1912, when Mr. Jones was appointed Outdoor Locomotive and Carriage and Wagon Superintendent on the South Eastern and Chatham Railway, Mr. Attock succeeded to his position on the Lancashire and Yorkshire Railway. It may be added that Mr. Attock comes of a family long connected with railway work, being the grandson of the late Mr. George Attock, Carriage and Wagon Superintendent on the Great Eastern Railway, and son of the late Mr. F. Attock, who was successively Superintendent of the Great Eastern Railway and Lancashire and Yorkshire Railway Carriage and Wagon Departments.

Mr. J. R. Billington, Chief Draughtsman, was born on April 18th, 1873. After finishing his general education at the Kirkham Grammar School, he spent nine months with Mr. T. Riley, contractor for the Preston and Wyre widening. He then began his ordinary apprenticeship at the Lancashire and Yorkshire Railway Works, Horwich, where he went through the fitting and erecting shops, incidentally being called upon to assist, for a short time, in the test room, in which he had an opportunity of seeing how the commercial testing of material, as well as special experimental work, was carried out. Mr. Billington followed up the theoretical side of engineering by attending the Horwich Institute and Technical School, and among a number of his successes the following may be mentioned: Whitworth Exhibition, County Council Exhibition, First Class Honours in Mechanical Engineering. In 1897, in addition to his ordinary duties, he was appointed teacher by the Institute Committee, and this post he has filled up to the present time. After his erecting shop experience, he became a draughtsman in the locomotive drawing offices, which position he held for about six years, having the rather unique experience of serving under the three successive Chief Mechanical Engineers, who have been in authority at Horwich, namely, Mr. Aspinall, Mr. Hoy, and Mr. Hughes. In 1902 Mr. Billington was given charge of the testing and inspection of materials department, which embraced the manufacture and testing of lifting tackle. He was next appointed to the gas department, where he remained for eight years, during which period he became Associate Member of the Institute of Civil Engineers, and Member of the Institute of Mechanical Engineers.

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London and North Western Railway: New Chief Goods Manager.

MR. F. T. KINSMAN has been appointed Chief Goods Manager of the London and North Western Railway, in the place of Mr. C. E. Grasemann, who has retired because of continued ill-health. Entering the company's service in 1869 at Holyhead, received the appointment of Goods Manager for the Yorkshire district, followed by a corresponding position in the Manchester district. In 1893 he was promoted to be Outdoor Goods Manager for the Northern Division, the duties of which office he discharged until two years ago, when, owing

MR. F. T. KINSMAN.

Mr. Kinsman was three years later transferred to the District Goods Manager's Office at Chester. In 1871 he became Outdoor Assistant in the North Wales district, and in 1876 Assistant District Goods Manager in Leeds. After the lapse of three years, he went as agent to the Camden Goods Station, remaining there until 1885, when he to the indisposition of Mr. Grasemann, he became Acting Goods Manager. Shortly afterwards he was appointed Chief Outdoor Goods Manager of the line, and has now in the ordinary course succeeded Mr. Grasemann, whose retirement is the cause of sincere regret among all his old colleagues.

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The Furness Railway System:

ITS SERVICES, RESOURCES AND ATTRACTIONS.

By W. T. PERKINS.

Photo] [*Raphael Tuck & Sons, Ltd.*

FURNESS ABBEY STATION.

ALTHOUGH in the last issue of the RAILWAY MAGAZINE thirty-two pages were devoted to an account of the services, resources and attractions of the Furness Railway, it was not possible to include therein a description of two important but wholly different features closely associated with the history of that system—the wonderful industrial establishment of Messrs. Vickers, Limited, and George Romney's Home.

Barrow is one of England's most remarkable industrial centres—famous, perhaps above all else, for the enormous naval construction works of Messrs. Vickers, Limited, which cover a site of 100 acres, fronting the channel dividing the Lancashire mainland from Walney Island. Even when the business of naval and merchant shipbuilding is at its lowest ebb, the Company employ 10,000 men, but I am informed that at the present time between 15,000 and 16,000 are there engaged. The number of workmen mentioned forms, however, only a moiety of the vast army in the service of Vickers, Limited, for the Company have altogether the following establishments :—

(1) River Don Works, Sheffield, for the manufacture of armour plating, guns, and mountings, and all kinds of forgings, castings, electrical machinery and railway material. (2) Naval Construction Works, Barrow-in-Furness, for the building of all types of war and merchant ships, with their machinery, gun mountings, hydraulic appliances, and shot and shell. (3) Ordnance Works at Erith, for the manufacture of quick-firing, Maxim, and machine guns, with their mountings, carriages, and ammunition. (4) Birmingham Works, for the building of the Wolseley motor cars, and motors for aeroplanes, dirigible airships, and boats. (5) Birmingham Works, for the manufacture of electric and ordnance accessories. (6) Crayford works, for making up cartridges, fuzes, and ammunition. (7) Dartford Factory, for making powder and ammunition. (8) Heavy Gun Range at Eskmeals, Cumberland, for proof of all types of guns and mountings, testing armour plates and shells. (9) Automatic and quick-firing gun ranges at Eynsford and Swanley. (10) Placencia de las Armas Company, Spain, for the manufacture of ordnance.

But the activities of the wonderful enterprise do not end even with this list, inasmuch as the Company possess interests in other undertakings allied to naval work, including Messrs. William Beardmore and Company, Limited, with armour-plate works at Glasgow and naval shipbuilding yard at Dalmuir, on the Clyde ; the Vickers-Terni Company, with great ordnance works at Spezia, Italy ; the Sociedad Española de Construccion Naval, which has undertaken the reconstruction of the Spanish Royal Arsenals at Ferrol and Cartagena, and the building there of a new Spanish Navy ; the Whitehead Torpedo Company, with works at Fiume, Austria, and at Weymouth, England, for the building of automobile torpedoes ; and the Chilworth Powder Company, for the manufacture of all types of explosive compounds.

THE VICKERS FAMILY.

For more than a hundred years members of the Vickers family have been engaged in making materials suitable for the purposes of

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war and for the peaceful pursuits of life, and well are they entitled to claim that they "have acquired an experience and organised a staff unexcelled in the world." It is, indeed, a stirring sight to watch the enormous body of artisans and labourers as they march to and from the Naval Construction Works in Barrow—the embodiment of health and vigour, contented, as they may well be, with the reward given to their labour, and representing a powerful moral force in the industrial life of the country. During the last ten years, Messrs. Vickers have built more than 100 vessels of war—representing every modern type in size and purpose, from the most powerful battleships and armoured cruisers afloat to the smallest gunboat required for river operation—collectively exceeding 300,000 tons displacement. Within the same period they have manufactured machinery for over 110 warships, aggregating altogether about 550,000 horse-power, including turbine machinery for H.M. ships *Lion*, *Princess Royal*, *Dreadnought*, *Vanguard* and many others. Simultaneously gun mountings have under the same roofs been produced for more than 50 battleships and cruisers, the guns being made at the Company's River Don Works, in Sheffield.

The capital invested by the Company exceeds £8,000,000, and they have spent more than £5,000,000 upon the machinery and plant used in the manufacture of war material They are able to build, engine, armour, supply with guns and their machinery, fit torpedoes, and equip with all ammunition and war stores any type of ship, without resorting to any company other than those for which they are directly responsible. In normal times they employ altogether at their various establishments over 25,000 highly-skilled workmen, and annually pay in wages about £1,600,000. Well might the late First Lord of the Admiralty say, as he did on a recent memorable occasion, "Had Messrs. Vickers not been invented, the first duty of the nation would be to discover them!"

Mr. McKenna appropriately added, in relation to the unlimited resources of the Company: "I regard the existence of a firm like Messrs. Vickers as a great national asset. We (the British Admiralty) buy from Messrs. Vickers, but feel that when they deliver armaments to us they are rendering a National service, and are giving of the best that England has to give in the way of material for the service of our National Fleet. We (the Admiralty) are in the position of buyers, and Messrs. Vickers are in the position of sellers, but I am happy to say that the relations between us and the Vickers Company are far more cordial than the ordinary relations of commerce." Foreign Governments have the same confidence in the Vickers Company, and in respect of its output for the Merchant Navy an equally high reputation is jealously preserved. It is impossible here to attempt a description of this magnificent establishment, but I may state that from 12 to 15 of the largest vessels of war can be erected simultaneously on its slips, and a launching hole is kept clear in the Walney Channel, Barrow, so that vessels may take the water as soon as they are ready to receive their guns and machinery. Two electric cranes in the yard rise to such a height that they may be seen from almost every part of Barrow. Each has a radius of 135 ft., and can easily lift any weight up to 150 tons.

The Housing Problem at Barrow.

I naturally asked Messrs. Vickers how that Company had solved the housing problem. It was obvious that 16,000 men engaged by one manufacturing establishment alone could not live within the confines of the borough; and they are, as a matter of fact, spread over a very wide area, fully 1,000 having their homes as far away as Ulverston, to and from which station they travel throughout the week at low fares. In Barrow itself private enterprise has in this connection always been encouraged by the Company. In the year 1899 which was a period of great activity, Messrs. Vickers erected 1,000 houses for their men on the east side of Walney Island, establishing a model settlement which has since been known as "Vickerstown." Subsequently the island was connected with the mainland by a bridge 1,123 ft. long, costing £175,000. The upkeep of this structure involves a rate of 1½d. in the pound. A toll of one halfpenny per passenger is also levied, and Messrs. Vickers have bound themselves to provide any deficiency there may be in the sum required for efficient maintenance. The Corporation tramway lines are laid across the bridge, and the model dwellings thus conveniently reached are always occupied. There is, however, still a scarcity in local housing accommodation. A large proportion of the workmen have bought the dwellings in which they reside with their

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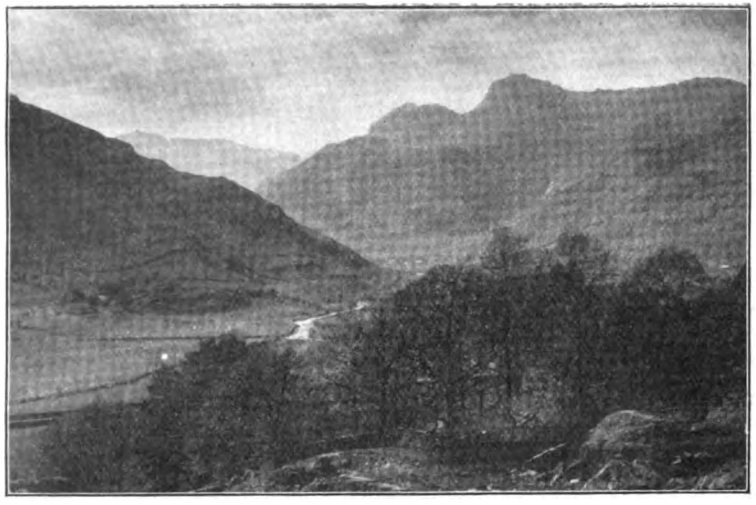
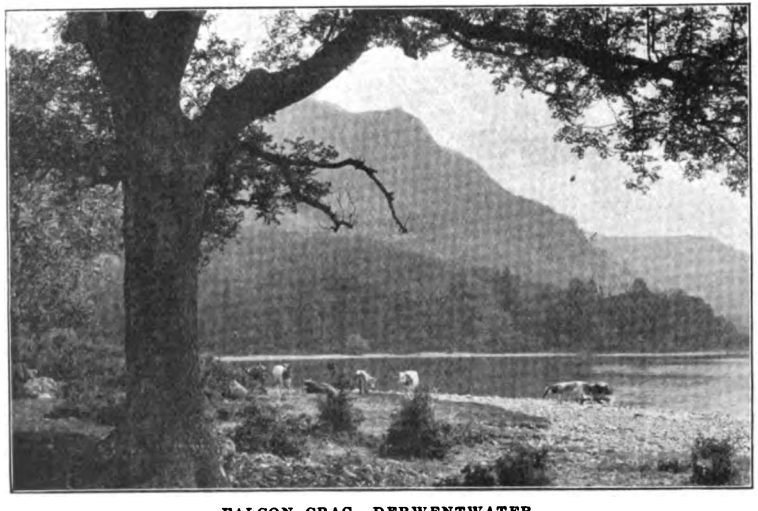


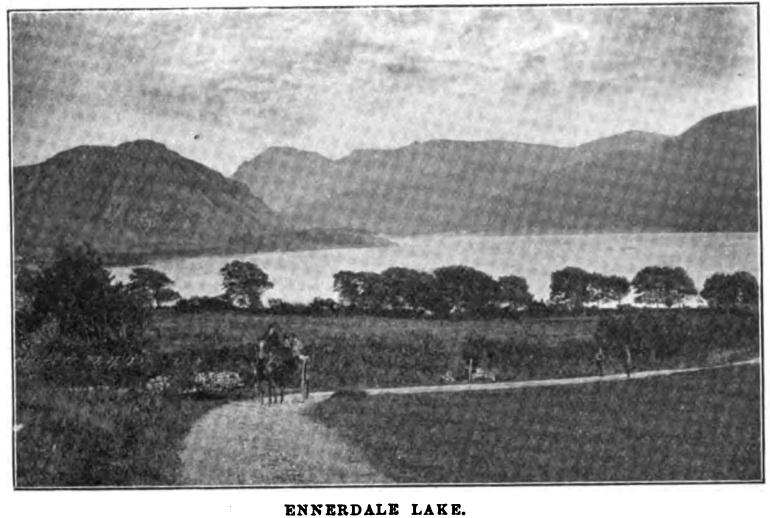
LANGDALE PIKES, FROM THRANG CRAG.

BLEA TARN, LANGDALE.



FALCON CRAG, DERWENTWATER.

G. P. Abraham]



ENNERDALE LAKE.

[*Keswick.*

VIEWS IN LAKELAND.

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families, and houses built to be let are in great demand. A portion of Cavendish Park —a high-class residential estate—has also been sold by the Furness Railway Company to the Barrow Corporation for building purposes, and there 250 houses are to be placed.

Important as it is itself, the establishment of Messrs. Vickers, Limited is only one of many in the town. There are, for instance, the Barrow Hematite Steel Works, of which the Duke of Devonshire is Chairman (including one of the largest Bessemer foundries in the country). The Blast Furnaces of the Barrow Hematite Steel Co. are capable of turning out over 250,000 tons of hematite pig iron yearly, and the vast Bessemer Steel Works of the company in times of prosperity producing 4,000 tons of steel weekly, employ over 2,000 hands. Other installations include those of the Asiatic Petroleum Co., the Anglo American Oil Co., the British Petroleum Co., the Producers Petroleum Co., the Barrow and Calcutta Jute Co., the Kellner-Partington Paper Pulp Co., (one of the principal firms of Barrow, employing 400 hands), Messrs. Walmsley & Smith's Corn Mills, Messrs. Burnip & Macdougall's Oil Refinery and Grease Works, Messrs. Burt, Boulton & Haywood, Ltd., and Messrs. Crosfield & Co.'s Timber Yards, Messrs. Gradwell & Co., as well as engineering works, iron foundries, breweries, chilled car and wagon wheel works. The town has had an amazingly rapid growth. In 1847 it was a village of little more than 300 inhabitants, but in 1871 there was a population of 19,000. Ten years later a total of 47,000 had been reached; in 1891 the number was nearly 52,000; at the census of 1911 it approached 64,000, and is now over 70,000. Since the creation of the Salt Union, the rich bed of salt in Walney has been kept dormant, for reasons which may perhaps easily be guessed; but should its working be resumed, a further impetus will be given to the trade of the port.

George Romney's Home.

George Romney, the successful rival of Sir Joshua Reynolds, was born in 1734, at Beckside, near Dalton-in-Furness, which place his father afterwards sold, and purchased a small estate, in the same parish, called Upper Cocken, standing upon high ground less than two miles from the Central station, Barrow-in-Furness. This property commands extensive and charming views of Walney Island, Morecambe Bay, the Duddon Estuary, Coniston Old Man, the Irish Sea and the Cumberland hills, while on fine days the Isle of Man and the Snowdon range of mountains may also be seen.

John Romney, his father, was a cabinet-maker, and having reached the age of ten years, the son was taken from school and put to employment in the shop at Upper Cocken. His talent for the art in which he afterwards excelled was first called forth in a very curious way. He had seen at Church a stranger, the singularity of whose features made a strong impression upon his mind. Being asked to describe them, the boy seized a pencil, and sketched the man's face so truthfully as to excite the admiration of his relatives and friends. Encouraged by their praise, he began to devote himself to more serious study of the art. In his 21st year he was, by the advice of a Mrs. Gardner and a relative—one Mr. Lewthwaite, of Millom—apprenticed at Kendal to a travelling portrait painter named Steele, who had received some instruction in Paris from Carlo Vauloo. From Kendal he went to York with Steele, and in 1762 started his successful career in London. In 1909 Romney's early home was restored by the Furness Railway Company, and opened to the public at a charge of one penny, but holders of railway and steamer tickets are admitted free to the house and its grounds.

Upon the site of the original cabinet-maker's shop, the Company have established a museum, in which copies of some of Romney's most celebrated pictures, engravings and photogravures are preserved. The caretaker is Mr. A. F. Fowkes, an enthusiastic admirer of the artist, who evinces much pleasure in describing the interesting features of the Home, bestowing unceasing pains in the preparation of an exact copy of Romney's diary recording the sittings which he gave to a large number of distinguished persons. The first portrait George Romney painted was that of Lord Parker, who attended at 9 a.m. on March 27, 1776, and the last was the Bishop of Lichfield, whose appointment was for December 31, 1795. In all 9,000 sittings are chronicled, and in 1786 Romney's total earnings were £3,765, the highest price which he ever received for a portrait being 150 guineas. Unlike Reynolds, he never allowed any of his pupils to touch his work, and as he executed fully 100 portraits in the year, we are able to realise

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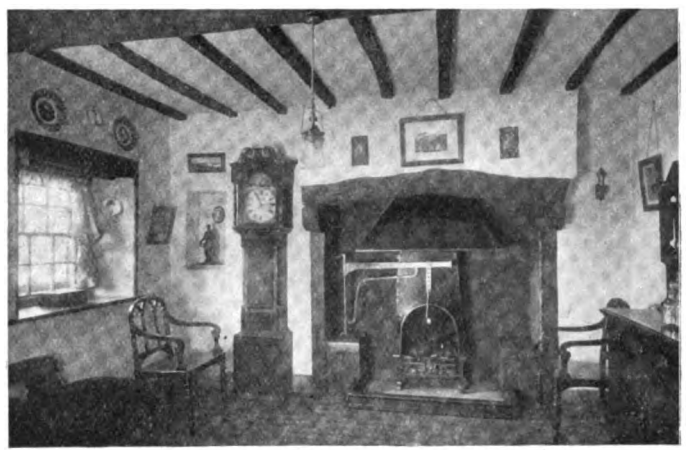
THE HOME AND MUSEUM.

REFRESHMENT PAVILION (IN GROUNDS OF GEORGE ROMNEY'S HOME).

INTERIOR OF THE MUSEUM.



KITCHEN.

GEORGE ROMNEY'S HOME, 1742–1755: NEAR BARROW-IN-FURNESS.

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COPY OF ROMNEY'S FAMOUS PICTURE ANNE, LADY DE LA POLE, SOLD AT CHRISTIE'S ON 13TH JUNE, 1913, TO MESSRS. DUVEEN BROS. FOR £41,370—THE HIGHEST PRICE EVER PAID FOR A SINGLE PICTURE.

the extraordinary rapidity which he found possible in the studio.

The following are some of the prices realised at auction since Romney's death for his chief works :—Lady Coote, £10,000 ; Mrs. Pierse, £7,350 ; Lady Clifden and Lady E. Spencer, £11,025 ; Duchess of Gordon, £5,500 ; Marchioness of Townshend, £5,460 ; Mrs. Crespigny, £5,880 ; Lady Hamilton (nature), nearly £20,000 (picture now in the Louvre, Paris) ; Mrs. Lee Acton, 16,000 guineas (which price the owner declined) : Master Thornhill, £6,090, sold April 25th, 1913. Just as this article was being completed, the *Daily Telegraph* published the following important announcement respecting an anticipated sensational sale of another of Romney's masterpieces :—

"Suppressed rumour has now burst its lid, and we are able to announce that the great picture sensation of the year is timed for Friday, June 13th, after the Oppenheim pictures (including the Perkins Hobbema) have been sold at Christie's. For some time past those bewildering picture publicists known as the cognoscenti have been hinting that in the King Street cellars was a portrait destined to obliterate all picture sale records. We have known it, too, but having been sworn to silence, we could not break faith. However, 'let go' is the word now, and it is safe to prophesy that all the maxima of the British school at auction will go by the board when this Romney full-length portrait of Anne Lady de la Pole has reached its last bid on June 13th.

"Painted in 1786, when Romney was 52 years of age, the portrait represents a graceful dame, wife of Sir John William de la Pole, sixth baronet, five years after her marriage. In white satin dress, with puffed white muslin sleeves, pale green sash, and 'shoes to match,' the lady leans her left elbow upon a stone pedestal, against a landscape background. Her dainty right arm is brought before her so as restfully to place the finger-tips on the edge of the pedestal aforesaid. Archly turning her face to the right, Anne Lady de la Pole gives us the living likeness of an eighteenth century aristocrat. As such she has graced Shute House, the Axminster home of the De la Poles, since the picture was painted, and has not been publicly exhibited. It is believed that Sir Frederick Arundell de la Pole has resisted many offers from private negotiators, and the public will, therefore, have the opportunity of testing in the open market what the big dealers are prepared to offer for a picture which has been removed from the area of their diplomatic blandishments."

Increasing public appreciation is being manifested of the little cottage and its surroundings, to which has been added a neat pavilion and outlook, where visitors may obtain luncheons, tea and other refreshments. Immediately adjoining the property is an extensive red sandstone quarry, from which was taken the whole of the stone used in erecting the handsome Municipal Buildings now standing in Barrow. Lovers of art from every quarter of the globe must feel indebted to the Furness Railway Company for having preserved such a distinctive and memorable association of Romney's life.

———

Golf may be played on 14 different links adjacent to stations on the Furness Railway, and tickets at single fare and a quarter are issued to all these stations on production of card of club membership duly registered. It ought to be added that the Furness Railway Company issue one of the simplest and best arranged pocket time tables in the country, improved by Mr. Aslett upon a capital model which he found in use upon the Swiss railways. An excellent series of illustrated postcards are also published—

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some coloured, others glazed. The series comprises 20 sets, six cards in each, and together they form a peculiarly valuable collection of admirably executed views. There is much useful literature to be obtained relating to the railway, including (1) Burrow's Guide to the Lake District; (2) The Annual Illustrated Guide of the Company; (3) "Windermere, the Tourists Ideal Resort," containing the current time tables; (4) "Tours through the English Lake-land"; (5) "The Tourist Programme"; (6) The "Handy Guide to the Ruins of Furness Abbey" by the late Mr. J. P. Morris, revised by J. Turner, and several smaller prints relating to separate rail or steamboat services.

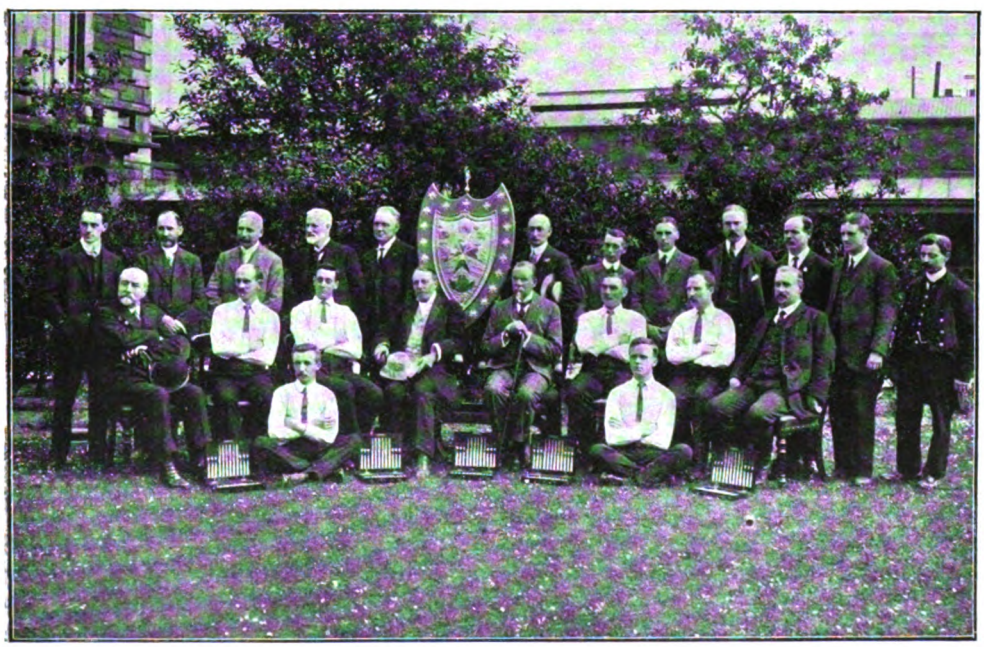
For the groups of photographs of celebrated spots in the Late District (reproduced in this article and in the July issue) the RAILWAY MAGAZINE is much indebted to Mr. G. P. Abraham, of Keswick, who has published an album of views to which no fewer than 22 prize medals have been awarded for artistic excellence. This album is sold at one shilling net, and it may be commended as a singularly valuable souvenir of a holiday spent in a region which Wordsworth described as "the loveliest spot that man hath ever found."

In the last Inter-Railway Ambulance Competition held at the Portman Rooms, London, when 26 teams in England and Wales competed, the Furness Company's team won the silver shield, presented by the St. John Ambulance Association, their score being 221 marks, against 153 obtained by the Alexandra Docks and Railway team (the winners in 1912), who were second, the records of the other competitors being as follow :—

	Marks.
3. London and North Western ..	138
4. Midland and Great Northern Jt. ..	120
5. Great Western	86½
6. Great Central & L. & N.W. Jt. ..	75
7. Lancashire & Yorkshire	66
8. Hull & Barnsley	58

The Furness team was composed as follows :—

P. Probert (Capt.)	Signal Department.
W. Uren ..	Foundry, Loco. Dept.
D. Graham ..	Fitting Shop Loco. Dept.
T. H. Parker ..	Plumber, Engineer's Dept.
W. Barr ..	Clerk, Barrow Goods.
W.J.Tyson (Res.)	Clerk, Secretary's Office.



THE FURNESS RAILWAY TEAM: WINNERS OF INTER-RAILWAY AMBULANCE SHIELD, 1913

Back Row—left to right: (1) Mr. Hope, (2) Mr. Telford, (3) Mr. Jackson, (4), Mr. Brockelbank, (5) Mr. Thompson, (6) Mr. Haynes, (7) Commander Bissett, (8) Mr. Rutherford, (9) Mr. Curson, (10) Mr. Wilks, (11) Mr. Dickinson, (12) W. Bull.

Middle Row: (1) Dr. Williams, (2) T. H. Parker, (3) D. Graham, (4) Mr. Aslett, (5) Mr. Ramsden, (6) P. Probert, (7) W. Uren, (8) Mr. Pettigrew.

Front Row: (1) W. J. Tyson, (2) W. Barr.

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It is pleasing to learn that, in addition to the prizes offered by the St. John Ambulance Association, consisting of one dozen dessert knives and forks, the Directors of the Company have presented each man of the team, the reserve man and the late captain, G. T. Wilks, with a sum of £5.

We have been favoured with the following particulars of the L. & N.W. and Midland Lake District arrangements for the present summer:—

TRAIN SERVICE BETWEEN LONDON (EUSTON OR ST. PANCRAS) AND THE FURNESS RAILWAY JULY, AUGUST, AND SEPTEMBER.

		Thursdays and Fridays excepted. Will run during July and August only.	Thursdays and Fridays only in July and August, daily in September.						
	night.	night.	night	a.m.	a.m.	a.m.	a.m.	p.m.	p.m.
London (St. Pancras) dep.	..	12A 5	12A 5	4 50	9 45	..	11 30	1 30	..
,, (Euston) .. ,,	12 5	..	..	5 0	10 5	11 25	..	2 0	5 30
				p.m.	p.m.	p.m.	p.m.		
Grange .. .. arr.	7 23	8 22	9 53	12 29	4 2	5 10	6 1	7 36	11 5
Ulverston .. .. ,,	7 49	9 4	10 19	12 45	4 18	5 21	6 27	7 49	11 24
Lake Side (Windermere) ,,	8c25	9 2	10 50	1 20	5 10	5 50	7 0	8 20	..
Bowness .. .. ,,	9c10	10 30	11 35	2 5	5 55	7B40	7B40	..	..
Ambleside .. .. ,,	9c45	11 5	12 10	2 40	6 30	8B15	8B15	..	..
Furness Abbey .. ,,	8 10	9 25	10 40	1 4	4 34	5 35	6 46	8 4	11 38
Barrow .. .. ,,	8 20	9 35	10 50	1 11	4 40	5 42	6 53	8 10	11 45
		p.m.	p.m.						
Whitehaven .. .. ,,	10 7	12 20	12 20	2 55	6 17	7 40	..	9 55	..

	Thursdays and Fridays excepted. Will run during July and August only.	Fridays only.	Friday exc'pt'd
	p.m.	p.m.	p.m.
Whitehaven .. .. dep.	3 35	7 30	7 30
	p.m.		
Barrow .. .. .. ,,	6 52	9 0	9 0
Furness Abbey .. .. ,,	7 0	7 50	7 50
	a.m.		
Ambleside .. .. ,,	6 0	7B15	7B15
Bowness .. .. ,,	6 30	7B45	7B45
	p.m.		
Lake Side (Windermere) ,,	7 40	8B35	8B35
Ulverston .. .. ,,	7 18	9 22	9 22
Grange .. .. .. ,,	8 13	9D35	9D35
	a.m.	a.m.	a.m.
London (St. Pancras) .. arr.	5 45	5 45	7 35
.. (Euston) ..	..	3 50	3 50

	a.m.	a.m.	a.m.	a.m.	p.m.	p.m.
Whitehaven .. .. dep.	..	6F40	8E10	11 30	2 45	3 35
				p.m.		
Barrow .. .. .. ,,	7 0	8F45	9 50	1 0	4 13	5 40
Furness Abbey .. .. ,,	7 10	8F55	9 58	12 30	4D18	5 50
				a.m.		
Ambleside .. .. ,,	..	..	9 15	10 55	2 50	4 5
Bowness .. .. ,,	..	..	9 45	11 25	3 20	4 35
				p.m.		
Lake Side (Windermere) ,,	7B 0	8 35	10 30	12 15	4 10	5 35
Ulverston .. .. ,,	7 31	9F16	10 19	1 20	4 36	6 11
Grange .. .. .. ,,	7 55	9F40	10 37	1D30	4 30	6 35
	p.m.	p.m.	p.m.			a.m.
London (St. Pancras) .. arr.	4 0	..	4 45	8 15	11 15	5 45
.. (Euston) ..	3 10	4 20	5 7	7 10	10 45	..

A. Leaves at 12 on Sunday nights.
B. Will not apply after September 13th.
C. Sundays excepted. Will arrive 80 min. later after September 13th.
D. Stops to take up passengers.
E. Corkickle Station.
F. On Mondays (Aug. 4th excepted), leaves Whitehaven (Corkickle) at 7.40, Barrow 9.17, Ulverston 9.39, and Grange at 9.55 a.m.

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The New Waterloo Station.

LONDON AND SOUTH WESTERN RAILWAY.

WE have to announce the completion of another large section of the new terminus of the London and South Western Railway at Waterloo, and the simultaneous opening of a suite of refreshment rooms intended to serve the requirements of passengers in what have hitherto been described as the Central and South Stations.

Entered from the Concourse—the spacious area intended to connect and give access to all the 21 platforms eventually to be provided—the refreshment suite consists of a handsome buffet on the platform level, with a dining room and a separate tea room on the first floor, all supplied from extensive kitchens above. The walls of the buffet are lined with various marbles, and the floor is laid with Roman marble mosaic, the effect generally being light and pleasing to the eye. A vestibule entrance adjoining the buffet contains an electric lift and a wide staircase to the dining and tea rooms. Panelled in English oak of Georgian design, the dining room is lighted by a range of windows on two sides. It is also well equipped with electric light, and ventilated by an admirable system of fans and air-shafts, which quickly carry away vitiated air. In this room will be served, at ordinary restaurant prices—and at tables to accommodate from two to six persons—a comprehensive menu, beginning with breakfasts at 7 o'clock in the morning, luncheons and grills at all times, an excellent five-course *table d'hote* dinner for 3s. 6d., or (alternatively) dishes à la carte, and appetising supper dishes, which are certain to be much appreciated by suburban residents returning from the theatres and other places of entertainment.

On the same level as the dining room is the tea room, furnished and served in accordance with all modern necessities. Not only at tea, but at luncheon there will be a range of tempting little dishes, hot and cold, of the class and at the price to which ladies

Photochrom Co., Ltd.] *London.*

AN ALCOVE IN THE NEW BUFFET: WATERLOO STATION.

are accustomed in the light refreshment shops of the Metropolis, while particular attention will be paid to the quality of tea, coffee and other beverages. One of the accompanying illustrations shows the model kitchen which forms such an important department in connection with the new rooms. Here the best and most up-to-date equipment has been installed. Adjoining the large cooking chamber, lighted from the roof and well ventilated, are various rooms, such as pot and crockery sculleries, plate room, vegetable room, sandwich room, pastry room, and kitchen stores. All these rooms are, where necessary, provided with hot and cold water and steam, while the larder contains two cold chambers—one for raw, and the other for cooked meats, as well as a refrigerated box for fish. The kitchen itself has a large coal range, with four ovens. Then there are *bains maries*, salamander, coke grills, gas roasting oven for meat, pastry oven, vegetable and other steamers. The *chef* has his own room, and provision is made in like manner for the personal comfort of the entire staff engaged in the refreshment department.

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THE OLD REFRESHMENT ROOMS, SHOWING PART OF THE ORIGINAL ROOF OVER NO. 1 MAIN LINE DEPARTURE PLATFORM.

Now that Waterloo station is so well equipped in regard to the supply of refreshments, residents on the South Western line who come to London in large numbers for the evening entertainments will find it to their advantage to dine in this attractive restaurant. From the new terminus the Tube Railways will take them within a few minutes of every part of the West End; and, if there should on any occasion not be time for dinner, they will be able to enjoy on return a hot supper, knowing that afterwards they will have only a few yards to walk to the train which is to convey them, before or after midnight, to the district wherein they reside.

When the new station has been completed, a second refreshment room will be opened in that portion now known as the "North Station," standing on the York Road side of the property. But the sectional divisions indicated by the names "South Station," "Central Station," and "North Station" will then have disappeared, and with them will have gone for ever, we firmly believe, all the confusion of the past. Various branches of traffic will, as far as practicable, be permanently associated with particular platforms, so that regular travellers will always know the points of arrival and departure, while a central and conspicuous Train Indicator will make plain to everybody not merely the platform from which each train will depart, but the one at which it will arrive and the time when it is due. All these details will be supplied to the indicator staff from Signal Box A, which bridges the main line just outside the station.

It was originally intended to re-construct the "North" as well as the "Central" and "South" stations, and to provide in all 23 platforms. But as the first-mentioned is quite a modern structure—having been opened in May, 1885—the Directors have determined to preserve its roof intact, making only such alterations therein as the requirements of better ventilation may necessitate. The consequent change in the design will, of course, result in a considerable financial saving, without in any degree diminishing the accommodation which it is necessary to provide. It is in the North section of the enlarged station that the future suburban electric traffic of the London

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THE NEW DINING ROOM: WATERLOO STATION.

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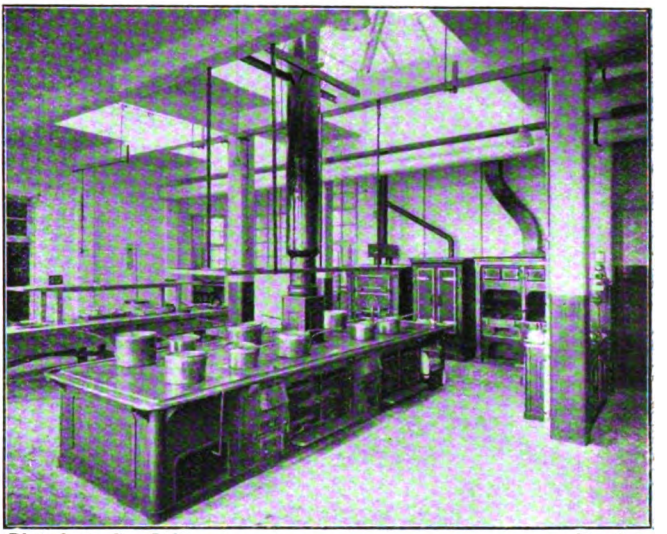
and South Western Railway will be concentrated, and it is possible that moving stairways, or escalators, may eventually supply a physical connection with the platforms of the City and Waterloo and the Baker Street and Waterloo underground lines, which are laid at a considerable distance below the street level. Such an improvement, although, of course, very costly, will add enormously to the public convenience, inasmuch as it will, on the one hand, give to the South Western what will virtually be an extended terminus at the Bank of England—in the very heart of the City of London—and, on the other, a direct link, by means of the Baker Street and Waterloo Railway, with the North-Western districts of the Metropolis, as also with the Metropolitan system at Baker Street, the Great Central at Marylebone, and the Great Western at Paddington.



Photochrom Co., Ltd.] [*London.*

THE NEW KITCHEN : WATERLOO STATION.

Of the 21 platforms eventually to be brought into use at Waterloo, seven have already been completed—trains running from the seventh for the first time on Sunday, the 29th June last—and the eighth is virtually ready for occupation. The very heavy demands made by the summer traffic will for several months retard rapid progress with the remaining platforms. But, having regard to the difficulties which have been encountered, the engineers and contractors employed to carry out the work are to be congratulated upon the fact that they have accomplished so much. It is especially creditable to Mr. Jacomb-Hood, the Resident Engineer, and to Mr. R. D. Hawes, his assistant in charge of the design and work, that, except by previous arrangement with Mr. Henry Holmes, the Superintendent of the Line, it has not once been necessary to hold up a train by reason of the complicated structural alterations proceeding. Nor has there been a single personal injury sustained by a passenger. And yet the work has been by far the most trying undertaken during recent years at any London railway terminus, the task for solution being the construction of an entirely new station while keeping the old one in full going order. As the property rests wholly upon arches, much labour has been performed away from the public eye. In some places the new roof has been erected above the old one—which was completed more than 60 years ago—and all the steel columns introduced have been taken down to a solid foundation. The site of Waterloo station was originally marshy ground, overlying a bed of peat formed by the Thames in olden times. Many people will be surprised to learn that deep down below the station, quite close to the Lambeth Free Library, a hidden tributary of that river—not the Effra—still runs from Brixton, finding an outlet into the main stream near Blackfriars. Consequently water was encountered in digging some of the foundations, and there it was necessary to penetrate to the London clay, which was found at a depth varying from 20 ft. to 30 ft. beneath the street level. Pumping operations were consequently imperative, but these were carried on without injury to the adjoining property.

To celebrate the partial completion of the new station and the opening of the refreshment rooms described, the directors of the company entertained over 80 railway and journalistic guests at luncheon in the handsome dining room, Mr. Hugh Drummond, the chairman of the board, presiding. Although it might have been regarded as a purely domestic gathering, in which only the London and South Western Railway was concerned, the occasion had a much wider significance, as there assembled not

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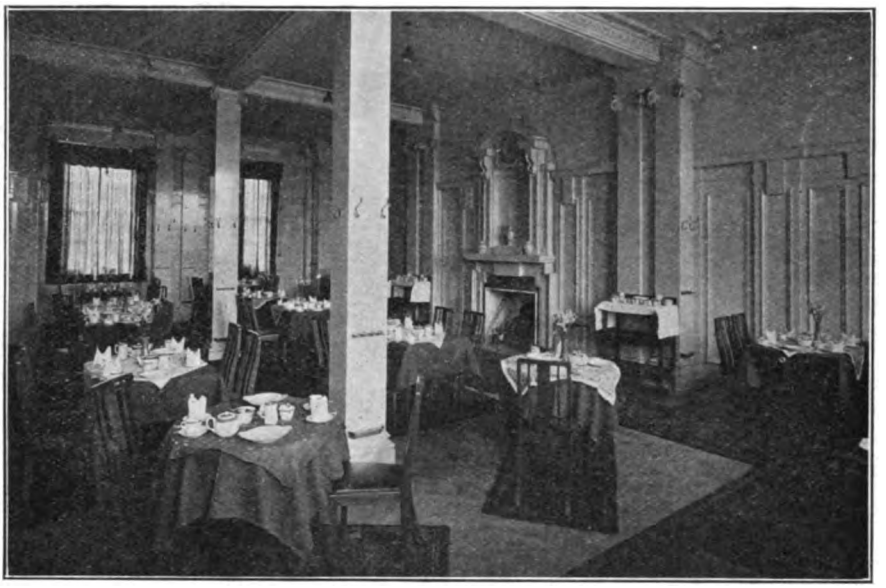

THE NEW TEA ROOM : WATERLOO STATION.

merely the hosts, with Mr. H. A. Walker, the General Manager, and all the chief officers of that company, but also leading representatives of neighbouring systems—Mr. Frank Potter, General Manager of the Great Western; Mr. Walter Hyde, General Manager of the Great Eastern; Mr. A. H. Stanley, Managing Director of the Metropolitan District Railway; and Mr. R. H. Selbie, General Manager of the Metropolitan Railway. The toasts proposed were "The King," "the London and South Western Railway," "Our Guests," and "The Chairman," the speakers being the Chairman, the Deputy Chairman (Sir William Portal), Sir Henry Lucy, Mr. Frank Potter, Mr. Hall Richardson, and Mr. T. P. O'Connor, M.P. It was acknowledged by all present that the new terminus would be a credit to the London and South Western Railway, that it opened a new and an important chapter in the history of the undertaking, and that it could not fail to bring an ample reward to the enterprise which it represents. The magnificent refreshment rooms were greatly admired, and it was admitted that Messrs. Spiers & Pond had in the luncheon served given signal proof of their determination to make the restaurant one of the most popular in London.

Among the sub-contractors, to whom credit must be given for excellent work performed in connection with the Waterloo station improvements, are the following:—

Marble Work: Messrs. Walton, Gooddy & Cripps, Ltd., Eagle Wharf Road, London, N.

Electric Lifts: Messrs. R. Waygood & Co., Ltd., Falmouth Road, London, S.E.

Locks and Fastenings: Messrs. Joseph Kaye & Sons, Ltd., Hunslet Works, Leeds, and 93, High Holborn, London, W.C.

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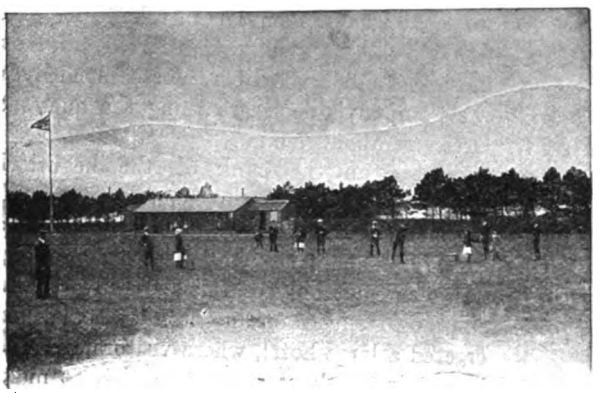
To Greenore and the North of Ireland.

GREENORE STATION.

TO those who take holidays after the summer has ended, the North of Ireland may be strongly recommended as well meriting their notice. By far the most convenient route thither is that *viâ* Holyhead and Greenore. The distance between the two ports is 79 miles, and the passage is usually completed by night in four hours. Four vessels are engaged, the latest addition being the turbine steamer *Greenore*, which has added greatly to the popularity of the service. As stated by the RAILWAY MAGAZINE in October last year, when this vessel first appeared in the fleet, excellent provision is made therein for first-class passengers, and all pleasure seekers, whether they travel first or third by rail, will find the comfort obtained well worth the extra charge levied for berths in the saloon. In state-rooms and ladies' cabins accommodation exists for over 170 first-class passengers, and there are also two *cabins de luxe*, for each of which an additional payment of ten shillings is required. Passengers who have engaged these cabins are allowed to embark at Holyhead at 9.30 p.m., and to remain on board, if they wish, for nearly three hours after the arrival in Greenore, so that they are assured of a good sleep before the sea passage begins. Baths in private cabins are reserved for holders of first-class through rail and steamer tickets. Rugs and pillows are supplied by the steward free of charge.



THE GOLF LINKS: LONDON AND NORTH WESTERN HOTEL, GREENORE.

The principal dining saloon on the main deck of the *Greenore* is furnished in very superior style, the walls being framed and panelled in solid oak. Similar treatment is seen in the first-class smoking room, which occupies a peculiarly appropriate position on the bridge deck. The floor of this cosy compartment is covered by india-rubber tiles, and the sofa seats, with divisional arms, are spring-stuffed and upholstered in the best Morocco leather. A special feature has been made of the rooms for lady travellers. Their sleeping cabin, amidships on the main deck, is decorated in white enamel, and immediately above this chamber

LONDON AND NORTH WESTERN BUNGALOWS AT GREENORE.

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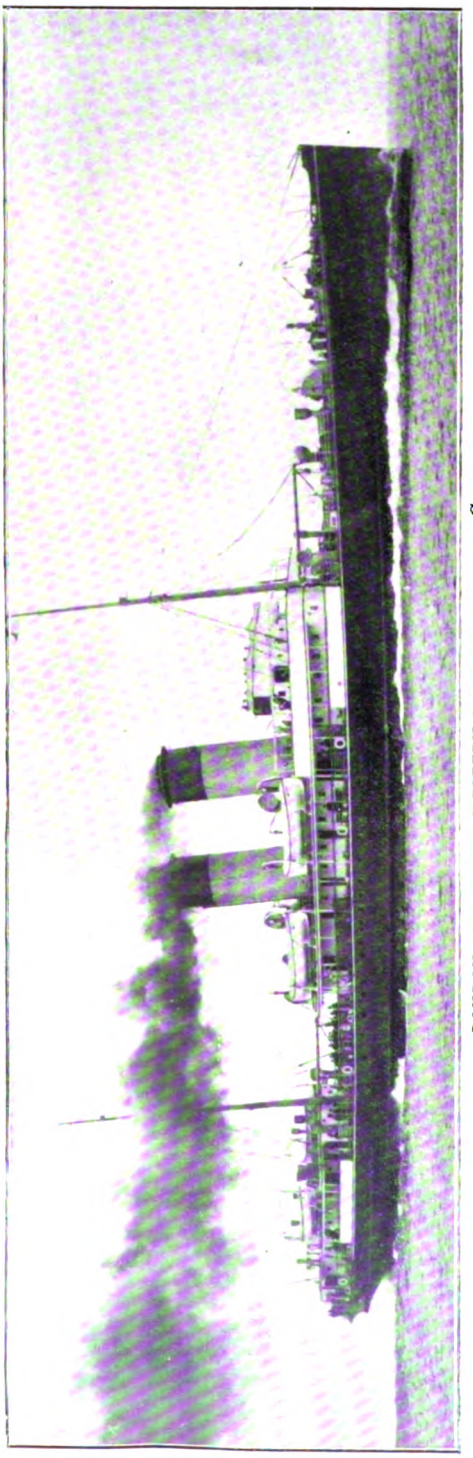

LONDON AND NORTH WESTERN RAILWAY STEAMER *Greenore*.

is a ladies' deck cabin fitted and furnished in like manner. Altogether sleeping accommodation is available in the ship for 170 first-class passengers. The other steamers running between Holyhead and Greenore are the *Galtee More*, *Connemara*, and *Rostrevor*, and all are exceedingly comfortable, enjoying the reputation of being "good sea boats." Every day in the week (Saturday excepted) the Greenore boat express leaves Euston at 8.45 p.m. Sleeping saloons are attached to the train, and Holyhead is reached at 2.17 a.m. On the down journey earlier trains can be taken from stations in England, so that a visit may be paid to any town *en route*, or a stay made at Holyhead before starting for Ireland. Passengers, mails, baggage, general merchandise and live stock are quickly transferred, and as near 2.40 a.m. as possible the steamer leaves the Company's docks, reaching the quay at Greenore about 7 a.m.

Situate on the bank of the beautiful Carlingford Lough, in county Louth, Greenore owes its present popularity entirely to the London and North Western Company, who have not only established railway and shipping facilities on an extensive scale, but erected a large hotel, where visitors are able to obtain excellent accommodation at most reasonable charges, especially when account is taken of the fact that these include green fees on the 18-hole golf course laid out immediately adjoining the hotel, and the unrestricted use of the steamers which daily make journeys up and down the waters of the lough. Bathing vans are nowhere to be seen, but swimmers can enjoy themselves to their hearts' content, and there is ample opportunity on every hand, of course, for the zealous fisherman. There are likewise croquet and lawn tennis courts, and for those who prefer the quiet life that bungalows afford, the Company have made ample accommodation in a range of buildings occupying an excellent position between the lough and the golf course. Greenore is, therefore, in itself a holiday resort of many attractions. It has the further advantage of a distinctly invigorating climate, and is in the midst of some of the most charming scenery of which Erin's isle can boast.

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Photo.] [*R. J. Purves.*

SOUTH EASTERN AND CHATHAM RAILWAY :
Sandling Junction, showing main line from Dover on the left, and Hythe branch on the right.

British Locomotive Practice and Performance.

By CECIL J. ALLEN.

A SUBJECT more than once touched upon in letters received from correspondents is that of locomotive piloting, and it is, therefore, my intention this month to devote some space to a consideration of this important question. Many and various are the queries which have been propounded. Why is piloting the practice accepted on one line and absolutely vetoed on another ? Why are pilots sometimes to be found on absurdly light trains, whereas exceedingly heavy expresses, which are losing time behind one engine only, are denied their assistance ? Is the more powerful of two engines drawing a train pushing its weaker sister, assuming the latter to be leading, in addition to pulling the train ? Which is the more correct arrangement of engines, in the case of a piloted express—for the more powerful locomotive to be leading, or the train engine ? Such are some characteristic interrogations that I will endeavour to answer.

In the first place it should be clearly understood that piloting is rendered necessary by exceptional circumstances—of road, load, or locomotive working, each of which may be considered separately. With special difficulties arising out of the grading of the road all, I suppose, are more or less familiar. The company whose main line is heavily graded throughout must make arrangements for meeting the demand, either in the limitation of loads, or the provision of enhanced locomotive power as compared with its neighbours. Local gradient difficulties, however, admit of local treatment. For instance, on the London and North Western main line, which is perfectly graded from London to Warrington, and not unduly difficult thence to Carnforth, a special "local" grade obstacle is presented in the last 62 of the 299 miles from London to Carlisle. On this account special measures are taken. Such trains as the 10 a.m. and the 2 p.m. *ex*-Euston are lightened in view

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of this final stretch, the former being divided at Crewe, and the latter shedding several coaches before leaving Preston. But for any train whose composition is so heavy that the engine in charge is likely to lose much time on the prolonged grades, assistant engines are kept in steam at Oxenholme, where a special stop is made to attach the pilot, and the train is thus convoyed to the summit. For locomotive working purposes in this case the extra engine is usually taken on to Carlisle, so that it may be available, if necessary, for assisting an up train over the summit on the return journey. Since the introduction of the superheater engines, this practice on the northern section of the London and North Western Railway has, of course, become a great deal less common.

Similar arrangements prevail on the Midland Hellifield-Carlisle section, but in this case the pilot is detached at the summit, the train stopping specially for the purpose. Both the Midland and the London and North Western Companies use express engines as pilots, as the stretches to be covered include also high speed sections, where small-wheeled locomotives would constitute a dangerous encumbrance. Such a bank as Beattock, on the Caledonian Railway admits, however, of entirely different treatment. The Caledonian main line, going north from Carlisle, although by no means easy, is not exceptionally difficult save for this 10 miles from Beattock to the summit, which are inclined at from 1 in 69 to 1 in 88. Therefore, unless very light, the majority of trains stop specially at Beattock, where a tank locomotive is attached in the rear, and pushes the express to the summit, detaching itself there without any stoppage of the train by means of a special slip coupling. A number of corresponding instances might be cited. There are four similar banks on the North British Railway "Waverley" route between Carlisle and Edinburgh, not to mention Cowlairs bank, at 1 in 40, out of Queen Street station, Glasgow. On the Midland there is the Lickey bank, inclined at 1 in 37·7, on the West of England line between Blackwell and Bromsgrove. Such arrangements as those mentioned permit of the use of small-wheeled engines having a large tractive effort, their services being more valuable than those of large-wheeled express engines, seeing that no great speed is involved.

The only alternative to the provision of pilot engines or banking engines, as described, is to employ express locomotives throughout of such power that the local difficulties of grading could be overcome without appreciable loss of time, or to reduce the load of the trains correspondingly. In most cases it is barely possible to resort to the former practice, in view of the fact that the modern British express locomotive engine has well-nigh reached the limit of its dimensions, nor would it be desirable to do so, seeing that for the major portion of the journey there would be no use for the reserve of power. Reduction of train-loads is sometimes effected, but the pilot or banking engine, provided where necessary, is the more common method of dealing with local grade difficulties. By this means loads may be maintained without loss of time, the loss involved in the stoppages being generally more than swallowed up in the gain achieved on the incline. Neither is the expense particularly great, seeing that the provision of one or two engines in steam, kept at the bottom of the incline, is generally sufficient to meet all traffic needs. On the score of exceptional grading, therefore, assistant engines are justifiable.

It is not every railway which can lay claim to extraordinary gradients, but there is no line in the country without its experience of exceptional loads, and it is in this connection that the pilot engine is most familiar. On most railways maximum loads are specified for each type for express engine, any excess being met by the provision of a pilot, where one is available. The inherent absurdity of many of these specified *maxima* is that they bear no relation to the booked speed of the train, one maximum load, expressed either in weight, axles or vehicles, obtaining under all conditions. A notable exception to this practice is furnished by the Midland Railway. In the working time-tables of this company are shown the maximum loads allowed with every express, the *maxima* varying with the scheduled speeds, and being divided into four classes, corresponding to four groups of express locomotives with differing tractive power. These loads are given in tons, the train-loads being reckoned from the tare-weights of the carriages, which are inscribed on small plates fixed to the end of each coach. Compared with the average loads of other companies, such as the neighbouring London and North Western, Midland loads are light, but it must be remembered that Midland express train services are for the most part built up of tight timings over a uniformly difficult road, which with any but moderate loads would be

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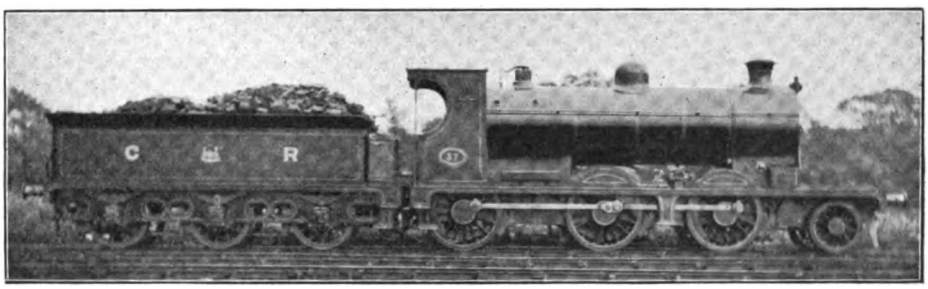
difficult of achievement with nothing but 4–4–0 or 4–2–2 engines available for haulage. Consequently the pilot has now become quite an established feature of Midland working, and it cannot be disputed that this free employment of pilots where necessary has contributed in no small degree to the reputation for punctuality which that company now enjoys. The practice of piloting in cases of exceptional load is generally followed, with one or two exceptions, the most noted among which is the Great Northern Railway. If not found among the written archives of that line, it is generally accepted that a veto is placed on the provision of assistant engines.

Attention may now be directed to the "cons" of piloting, the "pros" having been now dealt with at length. Expense constitutes a formidable objection, including as it does the doubling of the driver's and fireman's wages, and the increase in fuel and water consumption, together with wear and tear, consequent on the use of two engines instead of one. Also the leading engine is prone to throw up dust and grit into the bearings of the train engine, thus encouraging the latter to run "hot." Again, on lines with long non-stop runs, and undue distances between water-troughs, the second engine is unable to pick up any appreciable amount of water from the troughs if the leading engine has filled its tender, necessitating special stops for water in such cases. It must not be supposed, however, that—as certain correspondents in the past would have had me believe—the non-existence of piloting on any line constitutes an evidence that the standard locomotives of that line are capable of dispensing with pilot assistance at all times. From personal experience I should feel inclined to say that those lines on which the pilot makes the rarest appearance, or fails to make any appearance at all, have a correspondingly negligible record in the matter of punctuality.

Needless to say, it is not always possible for a pilot engine to be attached in all cases of exceptional load. Frequently at the station where the train is made up to the maximum load or over, no engine is available. Thus, even on lines where piloting is freely indulged in, it is often possible to see exceptionally heavy expresses running single-headed. Conversely, it becomes necessary for the pilot engine, after reaching its destination, to return to its shed, and, in preference to returning light, it is generally attached to the next express in the reverse direction, obviating any interference with traffic arrangements, at the same time putting the hauling capacity of the engine to good use. The latter may be a comparatively light train, which does not stand in need of piloting, and these remarks may, therefore, serve to enlighten readers who have experienced some mystification on this account. It should be understood, of course, that on most lines the limit loads are high. For



NEW 2–6–0 LOCOMOTIVE (SCHMIDT SUPERHEATER), CALEDONIAN RAILWAY.

Designed by Mr. J. F. McIntosh.

These engines are the first of the "Mogul" type to be introduced by a Scottish railway. The design is not greatly altered from that of the superheater 0–6–0 engines already in service, except as regards the forward extension of the frame, the addition of a pony truck, and changes in weight distribution and wheelbase.

Leading dimensions are as follows:—

Cylinders: 19½ in. by 26 in.
Coupled Wheels: 5 ft. dia.
Steam pressure: 160 lb.
Heating surface:—
Tubes: 1,071·3 sq. ft.
Firebox: 118·78 sq. ft.
Superheater: 266·92 sq. ft.
Total: 1,457 sq. ft.
Grate area: 20·6 sq. ft.
Weight of engine in working order: 54¼ tons.
Weight of tender in working order: 37¼ tons.
Coal capacity of tender: 4½ tons.
Water capacity of tender: 3,000 gallons.

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instance, the maximum load on the Great Eastern Railway for "Claud Hamilton" class engines is, I believe, one of 57 axles, so that a train of 14 eight-wheelers, which may with corridor coaches and restaurant cars total quite 400 tons when fully loaded, falls within the limit and runs unpiloted. The load for "Precursors" on the London and North Western Railway is allowed to run to 19½ vehicles, which equals a maximum of 13 eight-wheelers, and for "Experiments" to 20½, although I am not aware of the limits, should there be any, in the case of the superheater 4–4–0's and 4–6–0's.

Finally, a word may be added as to the effect that each of a combination of unequally-powered engines has on the other engine's work. One is so often asked whether, in the case of two engines hauling a train, if the train engine is more powerful than the pilot, it is not pushing the latter in addition to pulling the train. The question sounds logical, and yet is ridiculous. If the train engine were really pushing the pilot as well as pulling the train, why attach a pilot at all? The energy expended on the propulsion of the leading engine by the train engine would leave less for the haulage of the train, so that the former would be a hindrance instead of a help. There are, of course, certain extreme cases in which such a state of affairs would be possible. Were a locomotive with small driving wheels and inadequate power, say, piloting a powerful express engine over a level road, it is conceivable that the speed might be reached at which the whole of the tractive force of the pilot engine would be expended in overcoming its own internal friction. Therefore, if a higher speed were attained, the train engine would to a certain extent be pushing the pilot. It is held by many competent authorities that the Loughor accident on the Great Western Railway South Wales line was attributable to this cause. On that occasion a 0–6–0 saddle-tank was piloting a 4–4–0 engine of the "City" class over a level stretch, and the speed had reached the mile-a-minute rate. The supposition is that the leading engine, having thus ceased to pull, and consequently lost the steadying influence of the draw-bar, began to oscillate so violently as at last to leave the road.

A satisfactory explanation of the piloting question may, however, be easily afforded in the following way. Assuming that the pilot engine has a total tractive effort of a tons, of which x tons are utilised in its own propulsion, a-x tons will be available for the haulage of the train. Similarly I will assume that the tractive effort of the train engine is b tons, of which y tons are employed in moving itself. Then the train engine has b-y tons to expend in hauling the train. The total force exerted on the train is, therefore, the sum of these two quantities—$(a\text{-}x) + (b\text{-}y)$. Now the important fact to realise is that it is immaterial whether a-x be greater or less than b-y. As long as each engine is exerting more than sufficient effort to move itself, it will be neither pulling nor being pulled by the other. The pilot engine, for instance, is exerting a certain haulage effort on the train, and that effort is, so to speak, "passed through" the train engine, which is moving itself, and added to the force that

MIDLAND RAILWAY—LEEDS TO HELLIFIELD.

Type			Class 999, superheater.			Class 999 non s'hr.	Compound.		Johnson 4–4–0type
Run No.			1	2	3	4	5	6	7
Engine ..		Booked	†998	998	995	996	—	1032	737
Load (axles) ..		times.	26	28	32	39	28	34	30
Load (tons) ..			175	185	215	270	185	235	205
Miles.	Leeds	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4½	Newlay ..	—	7.25	7.40	7.40 *a*	7.05	7.40	8.25	7.35
10¾	Shipley* ..	15	14.40	15.25	16.05	14.00	15.20	16.20	16.00
17	Keighley ..	22	22.15	23.15	24.30	21.30	23.05	23.30	23.25
26	Skipton* ..	33	31.50	32.50	34.05	31.10	32.50	32.55	33.25
32¾	Bell Busk ..	—	40.20	42.15	43.10	40.40	41.50	41.40	41.50
36	Hellifield ..	47	45.00	47.30	47.50	45.20	47.05	46.40	47.30 *b*
36	Nett times ..	47	45	47½	46¼	45¼	47	46¾	46½

* Service slack (severe). † Piloted by rebuilt 4–4–0 engine.
a P.w. check, Shipley. *b* Signal check, Hellifield, outer home signals.

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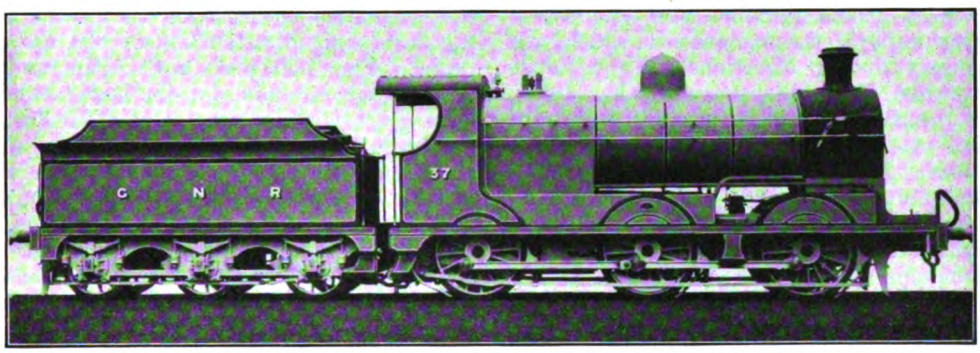
the latter is also expending on the train. Thus it is obvious that, save only in such an extreme case of piloting as obtained in the Loughor accident, it does not in the least matter whether the more powerful of the two engines should lead, or be attached next the train. The effect would be identical in either event.

The time has now come to turn to Performance, and the subject foreshadowed in the last issue—Midland locomotive work north of Leeds—furnishes a particularly apt illustration of the foregoing remarks. It will be well to preface the account of the runs made by a brief description of the gradients encountered between Leeds and Carlisle.



NEW GOODS LOCOMOTIVE (SCHMIDT SUPERHEATER): GREAT NORTHERN RAILWAY OF IRELAND.

The new goods engines fitted with Schmidt superheater recently placed in service by Mr. G. T. Glover, locomotive superintendent, are developments of existing engines introduced by Mr. Clifford, and were mainly designed by him, though constructed under Mr. Glover's superintendence.

Leading dimensions are as follows:—
Gauge: 5 ft. 3 in.
Cylinders: 19 in. by 26 in.
Coupled Wheels: 5 ft. 1 in.
Wheelbase: 16 ft. 11 in.
Steam pressure: 165 lbs. per sq. in.
Heating surface:—
Tubes: 975 sq. ft.
Firebox: 129 sq. ft.
Superheater: 250 sq. ft.
Total: 1,354 sq. ft.
Grate area: 22·9 sq. ft.
Weight in working order: 48 tons 10 cwt.
Water capacity of tender: 2,500 gallons.
Coal capacity of tender: 4 tons.
Weight of tender loaded: 31 tons 11 cwt.

This is one of the lengths of "exceptional" grading which first occupied attention, although altogether different to that of the corresponding stretch of the London and North Western Railway, in that the general "give-and-take" of the latter route is here replaced by almost interminable stretches of unbroken "collar-work." From Leeds to Aisgill summit, 1,182 ft. above the sea, the line rises almost uninterruptedly for 64½ miles, while on the opposite side there is a corresponding descent for 48¼ miles into Carlisle. The worst portions of the climb on either side consist of 15¼ virtually unbroken miles from a point 2¾ miles north of Hellifield up to the south portal of Blea Moor tunnel, and 15 miles from Aisgill northwards down to a point about 2¼ miles south of Appleby. Each of these grades is inclined almost continuously at 1 in 100.

Out of Leeds the line rises for a mile at 1 in 264, and then falls slightly for 1¼ miles at 1 in 310. Then follows a moderate ascent for 6 miles, mostly between 1 in 214 and 330, from Kirkstall to near Shipley, where a severe service slack is in force. A level stretch for 2 miles at this point is succeeded by a further 6¼ miles up, all between 1 in 223 and 244, although broken by one or two short strips of level. This takes us to a point ½-mile beyond Keighley, and there is then a short descent of 1½ miles at 1 in 247, followed, after a mile of level, by another 6¼-mile rise, this time at more moderate grades, to Skipton. The effect of a mile down at 1 in 212 beyond Skipton is spoiled by the severe slack at the North Junction. We are then introduced to a stiff climb for 7¾ miles, mostly at such grades as 1 in 150 and 162, but as steep in parts as 1 in 130. From the summit a short descent of 1½ miles at 1 in 350 and 215 brings us to Hellifield, where the principal interest of every down journey may be said to commence. The majority of the runs timed, indeed, were between Hellifield and Carlisle.

An excellent start is afforded from Hellifield, in that the 1 in 215 grade continues for 1½ miles beyond the station, steepening then to 1¼ miles at 1 in 184,

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which extend to within ½-mile of Settle Junction. A brief up-grade leads to the junction itself, where the 1 in 100 rise begins, and continues, with only brief intervals, up to Blea Moor tunnel, furnishing an almost continuous 1 in 100 length for 14¾ miles. Blea Moor box is situate about ¾-mile south of the tunnel entrance. From this point to just beyond Hawes Junction, a distance of about 8 miles, there is a species of "table-land," with undulating gradients having a very slightly falling tendency, and furnishing some comparison to the Grayrigg-Tebay stretch of the London and North Western Railway. This short portion of the journey is one of special interest to the student of geography, as the train crosses a general watershed, and glimpses are obtained of river valleys, the streams of which run in very diverse directions. From Settle upwards the line ascends the valley of the Ribble, which empties itself into the sea between Blackpool and Fleetwood. After passing by means of Blea Moor tunnel under the spurs of Whernside, the line skirts on the left the Dent Valley, which drains into the Lune, and thence into Morecambe Bay. Immediately afterwards, at Hawes Junction, the head of Wensleydale is passed, on the right of which the river finds its way into the Humber, while finally, after a short final climb to Aisgill, 1,182 ft. above the sea, the railway enters upon the Eden Valley, to which it keeps fairly closely all the way to Carlisle, the river in this case running into Solway Firth. The final climb to the summit consists of 2½ miles at 1 in 166 and 328.

A steep descent at once begins, continuing without a break for 15 miles, and reaching almost to Appleby. Then, however, there follow 1½ miles up at 1 in 183, Appleby itself being situated on a short undulating stretch, also about 1½ miles long. The actual start northward from Appleby is adversely graded for a mile. After this there is another 13-mile descent, but in this case more broken, and not nearly so steep as that preceding. The grade is at 1 in 121 for over a mile, but is very moderate thence to Langwathby, where there is found ½-mile sharply adverse. An undulating 2 miles from the conclusion of this bank past Lazonby is succeeded by 1½ miles up at 1 in 165, and then follow a series of sharp undulations: 2¼ miles at 1 in 220 and 176 down, ¾ mile at 1 in 221 up to Armathwaite, ¾ mile at 1 in 137 down, and 1 mile at 132 up in conclusion. Then comes a steep 7-mile descent almost to Carlisle, nearly all inclined at from 1 in 129 to 134, making an awkward start for up trains, followed by an undulating mile into the Citadel station. This is, therefore, an exceedingly difficult road, although its difficulties are minimised when a pilot is provided to the summit.

The schedule times are all framed on uniform lines, and are in several cases considerably faster than the public time-books would lead one to expect. From Leeds to Hellifield 47 min. are allowed in most instances for the 33 miles, in the proportion of 15 min. Leeds to Shipley (10¾ miles), 18 min. between the slacks at Shipley and Skipton (15¼ miles), and 14 min. for the last steep 10 miles to Hellifield. Considering that this stretch is almost entirely adverse to the engine in this direction, these are smart times. The 1.30 p.m. *ex*-St. Pancras is allowed only 13 min. for the last section, making a total of 46 min. Out of Hellifield the booked times are really difficult. An allowance of 4 min. for the 3¼ miles from the start to Settle Junction is, to begin with, in the nature of a "counsel of perfection," while the 21 min. scheduled for the 14 miles of 1 in 100 up to Blea Moor box needs hard work, with its continuous average of 40 miles per hour, although it must be confessed that the time to this point is frequently improved on, even by unpiloted trains. Once into Blea Moor tunnel speed rises very rapidly, but the allowance of only 12 min. for the 11¼ miles from Blea Moor box to Aisgill summit is a shade too "tight" to be practical. Altogether, therefore, the total booking for the 28½ miles from Hellifield up to Aisgill is only 37 min. by all the important trains, entailing an average speed of 46·2 miles per hour over this difficult length. In accordance with custom, the bookings downhill are at moderate speeds, the 17½ miles from the summit to Appleby being allowed 18 min., and the 30¾ miles thence to Carlisle 31 min. One minute extra to each of the latter times is allowed in the case of the 1.30 p.m. *ex*-St. Pancras, which calls at Appleby.

Summing up these times, therefore, that the standard booking for the 76¾ miles from Hellifield to Carlisle non-stop is found to be one of only 86 min., equivalent to an average speed of 53·6 miles per hour throughout. Although Hellifield stands fairly high, such an average as this seems remarkable in view of the fact that a summit 1,182 ft. above the sea requires to be crossed. In the case of the 1.30 p.m., 56 min. are allowed for the 46

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miles to Appleby, and 32 min. for the 30¾ miles thence into Carlisle, representing average speeds of 47·0 and 57·6 miles per hour respectively. Excessive speed down the long grades is not customary, especially on the 1 in 100 between the summit and Ormside, where the speed seldom rises much above the mile-a-minute rate. Consequently, of the two last-mentioned bookings, the latter is by no means easier than the former, particularly in view of the broken grading in the neighbourhood of Lazonby and Armathwaite. It is a curious fact, which may not have struck the Bradshaw student who has not the working time-tables available, that the 9.30 a.m., 11.30 a.m., and 1.30 p.m. expresses *ex*-St. Pancras all leave Hellifield at exactly the same time intervals, *i.e.*, 2.24 p.m., 4.24 p.m. (Glasgow portion) and 6.24 p.m. The 2.24 and 4.24 p.m. expresses preserve the same intervals throughout to Carlisle, but the 6.24 p.m. only to Aisgill summit, as this is succeeded by the stop at Appleby.

The distinction between the work of the superheater and non-superheater engines is not nearly so marked in these runs as, for instance, in the London and North Western runs over Shap. It must, however, be remembered that the superheater engines, the runs of which are tabulated, were not designed for the use of superheaters, which have been added at a later date. Similarly the runs of the compound engines shown are variable as to result, so that no definite deductions as to the comparative work of the different types can with any satisfaction be drawn from the tables. The runs are, as usual, presented in tabular form for purposes of ready reference. Four types of engine appear in the first series of runs, which relate to the Leeds-Hellifield section—the superheater and non-superheater engines of the 999 class, the compounds, and in one instance an earlier 4–4–0 of the standard Johnson type, all, of course, being uniformly 4–4–0 engines. Run No. 1 possesses no particular interest save that of the fastest time out to Hellifield, as a pilot working home to its shed was taken for this distance. The second run is curious in its close adherence to the times of run No. 5 behind a compound locomotive with an identical load. In neither case was the work particularly brilliant, ½-min. being lost by the simple engine. Very fair work was done on the third occasion, the time of 13¾ min. from Skipton to Hellifield in particular being good.

Strangely enough, it was the non-superheater engine No. 996 which made the finest run of the whole series, as shown in column 4, although at the same time hauling considerably the heaviest load. The start was wonderfully brisk, Newlay, 4½ miles, being passed in 7 min. 5 sec., and a minute being gained to Shipley. For the 15¼ miles from Shipley to Skipton the time of 17 min. 10 sec. was also exceptionally good with this load, considering the prolonged upward tendency of the road. The very short descent beyond Keighley produced a maximum speed on this stretch of 64·3 miles per hour. To gain nearly 1¾ min. to Hellifield under such conditions was meritorious. The first compound run, as stated, had no features of special moment, but the second, independent of its curiously sluggish start, was a more enterprising effort, the times over each section from Shipley to Bell Busk being in each instance the fastest of the whole series. Such times as 16 min. 35 sec. from Shipley to Skipton, or 8¾ min. for the steep 6¾ miles from Skipton to Bell Busk, including the severe slack at Skipton North Junction, are especially worthy of

Photo] [*H. J. Purvis.*

MIDLAND RAILWAY:

11.10 a.m. Glasgow–London express near Aisgill summit, 4–4–0 locomotive No. 442 and 2–4–0 engine No. 253.

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note. No particular merit attaches to the last run, as time would only just have been kept even without the slack. One extraordinary feature of these runs lies in the uniformity of the times over the 9 miles from Keighley to Skipton. In all the three consecutive superheater runs, these were 9 min. 35 sec., in the compound instances 9 min. 25 sec. and 9 min. 45 sec., and in the non-superheater 999 class run 9 min. 40 sec.

It will, perhaps, be better to leave the large table of 14 runs between Hellifield and Carlisle over until the next issue rather than deal now with only a portion of it; but, before closing however, I wish to describe a couple of runs recently made on the Highland line, one of which emphasises the value of piloting, and will doubtless prove of interest to readers in northern latitudes. The train was the 3.50 p.m. "mail" *ex*-Inverness for the South, which I joined at Aviemore, and the load heavy, consisting as it did of one East Coast composite sleeper and 3rd class coach, one similar West Coast vehicle, one West Coast corridor coach, three of the latest vestibuled Highland coaches, and six other miscellaneous vehicles—total 12 coaches, all eight-wheelers, or 48 axles. To haul this extensive train, which weighed 312 tons empty, or about 335 tons with passengers and luggage, we had the services of one of the latest 4–6–0 engines, No. 27, *Thurso Castle*, piloted to the summit by one of the 4–4–0 Drummond "Bens" of the earlier type, No. 11, *Ben Macdhui*. By dint of stern self-control I contrived to bestow my chief attention on the running; but this is a matter by no means easy when travelling through a constantly-changing panorama of such magnificent scenery as that which the Highland Railway offers.

Photo] [*Tom M. L. Neish.*

HIGHLAND RAILWAY:

5.15 a.m. *ex*-Perth Sleeping Car train at Aviemore, 4–6–0 locomotive No. 30, *Dunvegan Castle*.

The Highland has what I believe would be generally admitted as the best equipped single-line track, from the point of view of fast running, that there is to be found in the British Isles. Tablet-exchanging at the passing-places is entirely automatic, and the loops are laid with such skill that there is scarcely any perceptible oscillation when passing over them at speeds as high even as 60 miles per hour. Thus, when the road is clear, the single line working has practically no adverse effect on the average speed. On the first section of this run, for instance, from Aviemore to Kingussie, we easily maintained for some distance a speed of 57·7 miles per hour, covering the 11¾ miles from start to stop in 16 min. 55 sec., although nearly 5 miles are on adverse grades varying from 1 in 120 to 200. Restarting smartly from Kingussie, Newtonmore, 2¾ miles distant, was passed at 45 miles per hour in 5 min. 50 sec., and the long climb to Drumochter summit was then entered upon. Up the initial 2½ miles of 1 in 95 speed fell to 30·2 miles per hour, although recovering, after 5 miles more at 1 in 200, 100, 150, 360, 1,450, 160 and 100 to 41·3 miles per hour on the brief ½-mile of level near Dalwhinnie. The latter station, 1½ miles distant from the level stretch, up a further grade mainly 1 in 100, was passed in 23¼ min. from Kingussie, the total distance being 13 miles. After Dalwhinnie station comes a 2½-mile stretch at 1 in 80, on which the rate fell to 26·0 miles per hour, although on the subsequent 1¼ miles at 1 in 100 and 150 it again recovered to 33·3 miles per hour. On the final 1¼ miles at 1 in 80 to Drumochter summit the minimum rate was 28·8 miles per hour, and we stopped at Dalnaspidal, 2 miles further on, in 37 min. 10 sec. from Kingussie start. Altogether the distance is 20½ miles,

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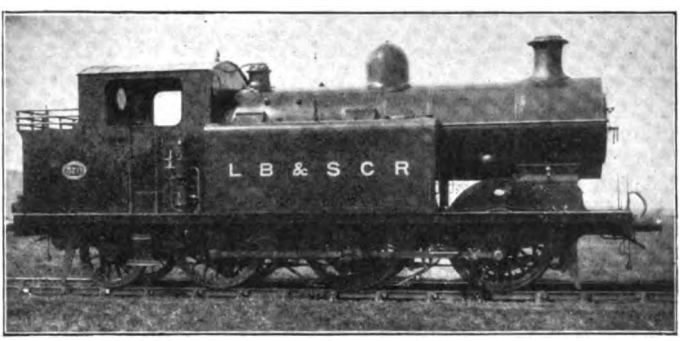
during which the line rises to an altitude of 1,484 ft.

In accordance with Highland custom, the speed from Dalnaspidal down to Blair Atholl —a 15¾-mile length inclined mainly at 1 in 70 to 80—was kept at a moderate figure, never even touching 60 miles per hour, and being mainly just above 50, although at one point reduced to 36. Consequently the start-to-stop time for this distance was one of 20 min. 50 sec. It might be mentioned that the line from Dalwhinnie over the summit to Blair Atholl is double throughout, but elsewhere the whole journey was on single line. Continuing from Blair Atholl with the one 4–6–0 engine, the 6¾ miles to Pitlochry, start-to-stop, were covered in 11 min. 5 sec., the actual stop, as at Blair Atholl, being made very slowly indeed, presumably in order to ensure that the whole of the long train was at the platform. The start from Pitlochry for 2 miles is downhill, as steep in parts as 1 in 90, and here we attained a maximum speed of 56·3 miles per hour, falling, however, to exactly 50 at the top of the mile at 1 in 132 beyond. The further short downhill stretch to Ballinluig raised the speed again to 55·6 miles per hour, and we passed this point, 5 miles from Pitlochry, in the smart time of 6 min. 40 sec. On the sharply undulating stretch beyond an average speed of about 45 to 50 miles per hour was maintained, the 8 miles from Ballinluig to Dunkeld occupying 10½ min., and on the 2⅛ adverse miles at 1 in 80 to Kingswood tunnel a minimum speed of 26·5 miles per hour was registered. On the sharp descent to Murthly (2½ miles at 1 in 75-82) we touched 56·3 miles per hour, but slacked for the station, and then fell away to a minimum of 38·8 miles per hour on the mile at 1 in 108 beyond. At Stanley Junction a very severe reduction of speed was made, this station, 21¼ miles from Pitlochry, being passed in 29½ min. The last 7¼ miles into Perth, mostly on favourable grades, were covered in 10 min. exactly, a maximum speed of all but 60 miles per hour being reached at Luncarty. Our total time from Pitlochry to Perth, 28½ miles, was thus 39½ min., the schedule time being 40 min., and considering the load and the difficult grades, this was a really excellent performance. It should be added that a violent south-westerly gale was blowing during the run, which was much in evidence on exposed portions of the line.

The trip which I made in the reverse direction was not of particular note, the train being the recent instituted Strathpeffer "Limited," which relieves the 11.50 a.m. North express *ex*-Perth, calling only at Kingussie and Aviemore, and then, avoiding Inverness, making the next stop at Dingwall. On the day I travelled the engine was No. 123, *Loch-an-Dorb*, one of the late Mr. Jones' 4–4–0 type, and the load one each East Coast and North British corridor coaches, a West Coast saloon, and three Highland coaches, totalling 145 tons. The same gale was blowing, if anything with more violence than in the evening. An inauspicious start was made, as we were brought to a dead stop at Strathord, before leaving the Caledonian system, and for some reason stopped also at Dunkeld, this initial 15½ miles taking 28 min. 40 sec. On the ascent to Kingswood the minimum speed was 30·6 miles per hour. Starting again, the undulating 8 miles to Ballinluig occupied 12 min. 35 sec., the 5 uphill miles thence to Pitlochry 7 min., and the 6¾ miles from there to Blair Atholl 11 min. 25 sec., speed falling on the 4 miles past Pitlochry, largely at 1 in 85, to 26·8 miles per hour. The gross time from Perth to Blair Atholl, 35¼ miles, was 61 min. 5 sec., and the net time about 53 min.

Now came the worst portion of the journey, the next 18 miles to Drumochter rising at 1 in 70 and 80 almost throughout. On the continuous 1 in 70 the speed at one time fell to 21·1 miles per hour, but then, curiously enough, without any change in the grade, recovered to 25·7, and still further to 27·6



LONDON, BRIGHTON AND SOUTH COAST RAILWAY: 0–6–2 TANK ENGINE REBUILT BY MR. BILLINTON.

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Photo] [*H. T. Worlock.*

GREAT WESTERN RAILWAY:

4–6–0 locomotive *Albion* on up South Wales Restaurant Car Express near Hayes.

on the final length of 1 in 85 to Dalnaspidal. The 15¾ miles from Blair Atholl to Dalnaspidal occupied 35 min. 35 sec. On the last 1½ miles at 1 in 85 to Drumochter the minimum speed was 31·5 miles per hour. The down grade to Kingussie was run very cautiously, as on the up journey, and, in consequence of severe signal checks at Inchlea crossing and Newtonmore, the 20½ miles from Dalnaspidal to Kingussie occupied 29¼ min. Thus our total time from Perth to Kingussie, 71½ miles, was 125 min. 55 sec., but this loss of nearly 9 min. on schedule time was more than accounted for by the stops and signal checks. The 11¾ miles start-to-stop from Kingussie to Aviemore were covered without further incident in 17¼ min. I am indebted to the courtesy of Mr. Robert Park, the General Manager of the Highland Railway, for kindly affording facilities for making these journeys.

Photo] [*A. J. Chisholm.*

GREAT NORTH OF SCOTLAND RAILWAY:

Goods train at Cullen.

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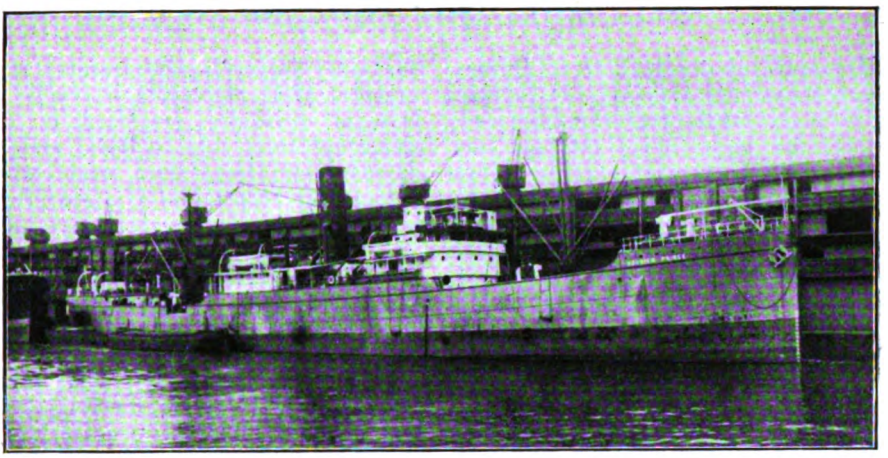

PRINCE LINE STEAMSHIP *Soldier Prince*, ENGAGED IN THE EGYPTIAN QUAIL TRAFFIC.

Railways and the Growth of Industries:

THE EGYPTIAN QUAIL TRAFFIC.

By CHARLES DIX.

THE previous articles in this series published in the RAILWAY MAGAZINE have been devoted to the growth of "home" industries, the object being to illustrate the beneficent attitude of our railways towards small and struggling industries and trading communities and the valuable assistance which they have rendered in connection with the development and prosperity of existing industries. But the subject of the present article scarcely represents a "home" industry in the sense that the commodity is produced in this country, although it represents a traffic which is of considerable value both from a railway and from a commercial point of view. It has been selected chiefly for the reason that it presents many points of interest in itself and at the same time shows how the railways are prepared to deal with special classes of traffic, necessitating exceptionally careful handling and special transit arrangements.

As most people are aware, the Egyptian quail is a bird which is regarded as a table delicacy of the highest order, and even with the immense quantities which now find their way into English markets the demand is said to be far in excess of the trade supply. The home of the quail is within the tropical zone of Central Africa, but the exact district has never been located, notwithstanding the many efforts which have been made to discover the rich deposits of guano which must have accumulated, and which will undoubtedly make the fortunes of the lucky finders. When the rainy season is over and the torrid heat has dried up the water-pools and scorched the life out of the coarse cereal vegetation that forms their staple food, the birds migrate northwards with one accord flying over the Soudan and along the valley of the Nile *en route* to the Mediterranean Sea and Europe. Arriving at the Nile Delta they appear to take the passage across the Mediterranean in three distinct sections and by three separate routes —the first direct to Asia Minor and Greece, the second spreading along the African Coast to Tripoli and crossing *viâ* Malta, while the third section traverses the African coast as far west as Algiers, thence crossing into Spain.

Continuing their flight the birds penetrate as far north as the Rhine Valley and Russia and are occasionally found in England. It is their presence in these countries which has given rise to the erroneous impression that the quail is a migratory bird of European origin. This northward migration produces the "Spring" season of the quail industry covering the months of February, March and April, the second or "Autumn" season, which is associated

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with the return of the quail from Europe, occupying the months of September, October and November. Of the two, the "Spring" season is the more important and the capture and collection of the birds has become a distinct native industry throughout the Nile Valley, towards which the quail intuitively and invariably makes flight as spring follows spring, in search of food and water. After the exhausting flight through the Soudan, the birds arrive in broken battalions, half blinded by sun and sand, and are caught by the natives in large hand nets. In smaller quantities the natives collect those which through weakness, or in search of food and water, have dropped on the way and are unable to rise, and they are all placed in wicker crates or cages and when fed and watered quickly recover, being apparently none the worse for their hardships.

Practically the whole of the quail trade is conducted by the Egyptian Quail Syndicate, which is controlled by three large Egyptian firms and has its headquarters in Alexandria. Something like a million quails pass through the hands of this syndicate every year. The captured birds are handed in at the syndicate's trading stations, which are scattered over the Nile Valley and Delta, and are thence forwarded in bulk, by means of camels, to a central depôt from which they are despatched by train to the huge receiving house at Alexandria. Here the birds are transferred to specially constructed coops, each coop accommodating 100 birds, and are despatched to England by fast steamers working into Manchester, and thence by train to London. Consisting of about 100,000 quails, each consignment is placed in charge of expert Arab attendants who accompany the birds through to London and return to Alexandria by the overland route. These attendants have in many cases been engaged in this work for twenty years or more, and are highly experienced in the feeding and watering of the birds and the many incidental necessities of the boat and train journeys, the cleanliness of the coops and adequate and judicious ventilation *en route*.

During the two seasons a succession of consignments, each consisting of about 100,000 quails, are conveyed by the Prince Line of Steamers at intervals of a fortnight, from Alexandria to Manchester, and so strong is the vitality of the birds, and the mortality consequently so extremely low, that they arrive in this country virtually intact. With this class of traffic, every care is obviously necessary in craning the coops from ship to dock, and special arrangements have been made with the Manchester Ship Canal Company for their proper handling. The quails are unloaded under the supervision of the syndicate's representatives and in the presence of responsible railway officials, and straightway placed in the railway sheds on the dock side. One of the chief features in the handling of the traffic is the consistent maintenance of the horizontal, and this feature emphasises the delicate nature of the traffic from the fact that any decided deviation from that position must have the effect of throwing the birds from end to end of the coop, resulting in broken legs and general destruction. The sea journey completed, the first essential is a smooth and rapid transit to the London Warehouse, at a rate of carriage which must leave a sufficient margin of profit to the trader. In this connection the railways have proved equal to the occasion, and by their enterprise and adaptability have not only secured a valuable traffic, but introduced a remunerative trade item and added to the scope of our English markets.

For some years past the traffic has been secured to the Great Northern route from Manchester to London, and on arrival of the steamer a train of covered vehicles is placed in readiness on the dock. The coops are loaded into these vehicles direct from the sheds, the train being then piloted into Manchester Central station, whence it is worked as a "special" at passenger train speed direct to King's Cross. Representatives of the Royal Humane Society are frequently in attendance, both on the boat and train, but as the very existence of the industry depends upon the expert care and humane treatment of the commodity, there is little or no ground for any strictures in this direction. The essential condition during the rail journey is proper ventilation and the vehicles used are specially fitted for the purpose; but needless to say smooth running of the train is also a matter of first importance and consideration. At one time it was the practice to stop the train before entering a long tunnel in order to close the ventilators and so exclude the smoke, the train again stopping and ventilation being restored after having passed through the tunnel. But this practice has been

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superseded by an increase of speed through tunnels, which has proved equally effective and more satisfactory from a working point of view. During the year 1911 one of the large spring consignments reached Manchester during the Coal Strike, and in consequence of the curtailed train service, some anxiety was felt as to the possibility of getting the quails to London in view of the special requirements of the traffic. The Great Northern Company, however, rose to the occasion, and by exceptional effort the quails were received from the Ship Canal authorities and the now familiar train of covered vehicles ultimately reached King's Cross within the usual time, notwithstanding the transit difficulties which had to be overcome.

A "QUAIL TRAIN" AT KING'S CROSS.

Arriving at King's Cross in the early hours of the morning, the quail train is worked into the goods station for unloading purposes, and there special lorries are in waiting. The birds are transferred by experienced loaders and straightway delivered at the syndicate's London warehouse, which presents a truly remarkable scene as the thousands of birds are received, and the coops carefully stacked, in the huge apartments specially adapted for their reception. Here the scene can be better imagined than described—the lofty rooms, spacious and well ventilated, the distempered walls, giving an additional impression of airiness and cleanliness, and the thousands upon thousands of wild foreign birds with their simultaneously continuous tri-syllabic cry, almost deafening in its intensity. In silent contrast, the dark-featured Arab attendants glide from coop to coop ministering to the wants of the quails, which appear to regard them with a friendly confidence all the more noticeable when compared with their wild shyness as evinced on the merest intrusion of a stranger.

The coops are 5 ft. long, and are about 15 in. wide by 7 in. or 8 in. high. Besides being fitted with feeding and drinking troughs, they are provided with a simple device for their daily cleansing; the canvas roofs containing a patent self-closing trap door through which the birds are readily removed. Once in the warehouse, the preparation of the quails for market immediately begins. The birds are fattened entirely upon millet, and, contrary to a somewhat prevailing impression, no artificial process is employed or is even necessary, the birds performing the function naturally by reason of their extraordinary voracity. It is computed that a full consignment of quails will demolish something like a ton of millet daily, and only a very short time elapses before the birds are ready for the table. They are then removed to the plucking room, there to be dressed and packed in boxes, by a staff of women and girls, who by long practice have become so deft in their work that as many as 60 birds are killed and prepared in almost as many minutes.

As I have already stated, there are

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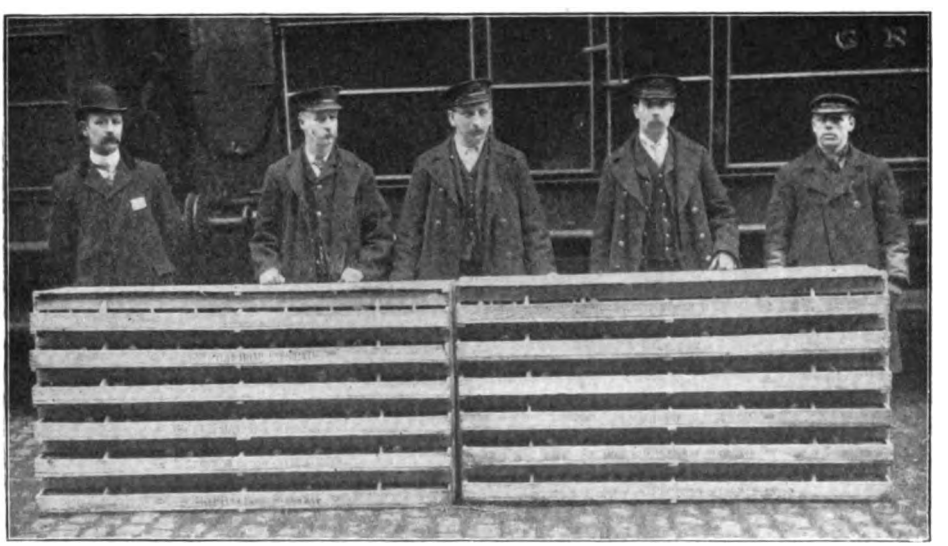
two seasons in the quail industry—the spring season as explained, being derived from the capture of the more or less straggling emigrants on their flight northwards from the impossible conditions of their central African home, the scene of operations extending throughout the Nile Valley, and a large proportion of the native population being engaged individually in collecting the birds. The second, or autumn capture, is, however, effected in bulk, and is confined to the littoral of the Nile Delta. With the approach of the European winter, the migrated quails begin to flock and return southwards, recrossing the Mediterranean Sea, guided no doubt by instinct inherited through centuries of quail habit, along the routes would scarcely appear to be necessary as, notwithstanding the hundreds of thousands captured every season, the birds continue to migrate in ever-increasing numbers, and it is evident that the present quail industry barely absorbs the fringe of the natural supply. The quail is wonderfully prolific, usually laying twelve to fourteen eggs twice a year, and having been known to nest even three and four times, so that its disappearance from the British Islands and some parts of Europe is more probably explained by climatic conditions rather than being attributable to any process of extinction. As with the spring consignments, the autumn quails are freighted to Manchester by the Prince Line of Steamers and are sent thence by rail to London.



QUAIL COOPS UNLOADED FROM THE TRAIN.

traversed on the outward journey. The Egyptian Quail Syndicate obtains its autumn supply at the Nile Delta. Arabs engaged in the work seem almost to scent the birds on their sea passage long before they appear and, timing their arrival almost instinctively, erect along the Delta coast, stretched between long poles, huge nets into which the birds, after their headlong flight across the Mediterranean, rush with tremendous force, and are ensnared literally in tens of thousands.

The Egyptian Government has enforced certain restrictions in regard to the industry which have the effect of a "close" season. But such restrictions, though ostensibly intended to protect the quail from extinction, But the wholesale transit of the birds by no means represents the only railway traffic consideration as, in addition to supplying the London Markets, large consignments of dead quails are conveyed by rail to all the large market centres of the United Kingdom, and many thousands of smaller consignments are forwarded to individual traders in different parts of the country.

Most of the English railways are affected to some extent in this distribution of the quail, for, while the Leadenhall and Smithfield markets in London absorb several thousands daily, the Glasgow, Edinburgh, Manchester, Liverpool, Birmingham, Nottingham, Leicester, Bristol, Dublin,

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Belfast and other markets also receive their share, and as well as traders, throughout the country from Aberdeen to Southampton, to say nothing of a very considerable traffic which goes to the Continent. In fact, the whole industry is surrounded with an atmosphere of travel and rapid movement, beginning with the original flight of the quails, then passing through the various stages of collection and export, and finally the actual distribution of the market commodity. It is a far cry from the Pilgrimage of the Israelites to the twentieth century, but the Biblical incident where "the wind that brought the quails from the sea, and let them fall by the camp," no doubt has reference to the autumn return of the quails from Europe. Their bi-annual flight has, no doubt, occurred regularly throughout the intervening centuries until modern business methods and organisation have made it possible to realise this natural source of supply and build up an extensive and thriving industry. Not the least important factor in this development is the transport which can so lend itself to the necessities of the traffic that within a month the quail can be captured, collected into suitable traffic bulk, and transported from Egypt to the dinner table of the Western World.

In conclusion I would like to express my thanks to Mr. W. Chitty, the Secretary of the Egyptian Quail Syndicate in London, to whose courtesy I am indebted not only for opportunities of personal observation but also for much of the information contained in the foregoing article.

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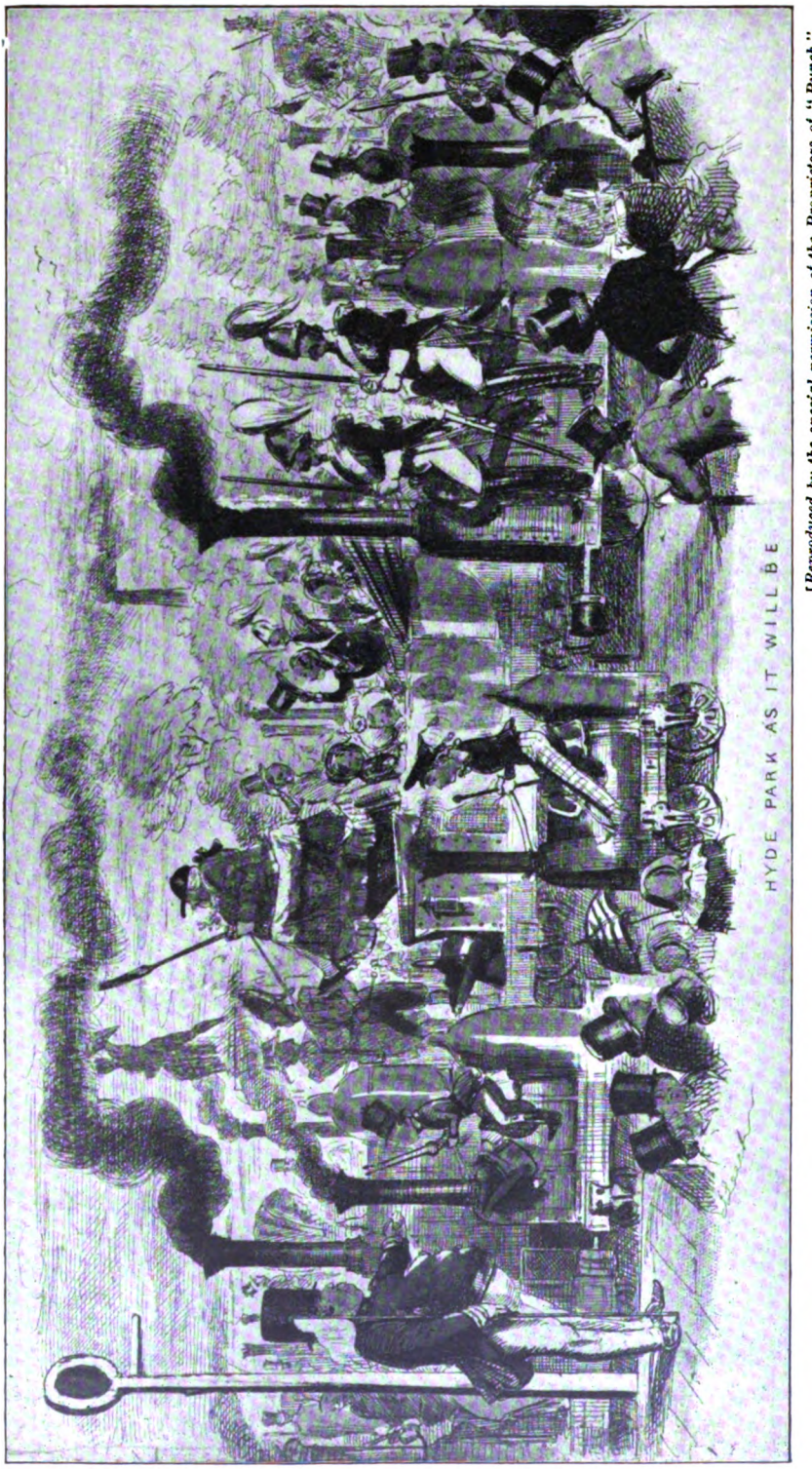

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A PROPHETIC PICTURE FROM PUNCH'S POCKET BOOK, 1846.

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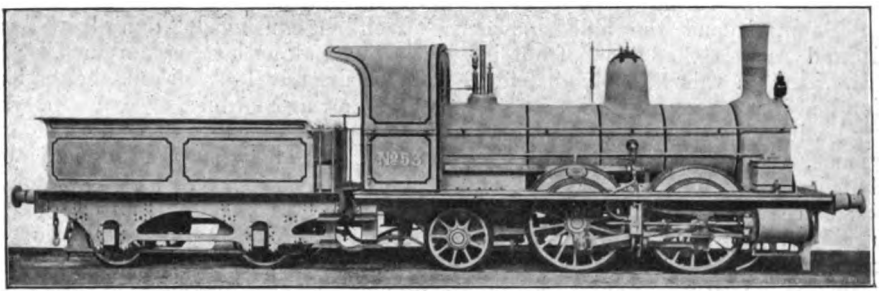

KITSON ENGINE: DANISH GOVERNMENT RAILWAY.

Leaves from the Log of a Locomotive Engineer [No. XI.].

By ROBERT WEATHERBURN.

Denmark and Mr. John Blair.

THE latter part of the month of March at Riga in 1871 did not belie its character as being one of the most unpleasant months of the year. Although the deeply frozen surface of the Duna and all the land were deeply covered with snow, still the "Bolshoi Maros" persistently sealed up every fount of life in his adamantine grasp. Yet the profound and impressive stillness of midwinter had given place to strong biting winds, and the snow that occasionally fell was no longer like fine pellicles of ice dust, but broad and flaky, patterned inimitably. These were tokens of the mysterious "Call of Spring," which in another five or six weeks would see the surface of the big river broken, to be piled up here and there with ice floes in chaotic confusion in their rush seaward.

At this period I received instructions to proceed to Aarhuus in Jutland (Denmark) and, with a letter of introduction to report myself to Mr. John Blair, the then Chief Mechanical Engineer of the Danish Government Railway, for whom there were several new locomotives consigned to be unloaded, erected and delivered to his satisfaction. The Gulf of Riga being still hermetically frozen, I proceeded overland by way of Dünaberg and Kovna, and at last arrived at the historic town of Königsberg, remarkable, among many other things, for its university, Iron Crown, and as being the birthplace of "Emmanuel Kant," whose statue stands in a deservedly significant position near the university. I had good reason to remember him, for in my earlier reading days the study of his recondite "Criticism" had given me such brain twisting that I gladly had recourse to Professor Wilson's "Tales of the Border," or to "Noctes Ambrosianæ" as an anodyne.

It was my third visit to Königsberg, and, after waiting two days, I was fortunate in securing a passage in one of the steamers of the Danish White Cross Line—indeed, the first vessel which had opened the navigation that season from Copenhagen. Being the only cabin passenger, I felt somewhat isolated, more particularly as the captain, with whom I had my meals, was, socially speaking, the reverse of everything Danish that I afterwards experienced. He was not only reserved in intercourse, but so painfully abrupt and repellant that when at table my position was anything but pleasant. All else on board were friendly and obliging. I spent the greater part of my time with the chief engineer, who, like the captain and all educated Danes, spoke excellent English. He inquired how I liked the captain, and seemed to understand the situation. After remarking that "he was, nevertheless, a thorough good fellow," he said, "The captain's favourite brother during the war

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between Denmark and the allied powers (Prussia and Austria) had his bottom jaw shot away, and in this horribly disfigured condition had for two years before his death to be fed with a spoon. The captain, in consequence, vowed at the time to treat Englishmen with contempt, as it was generally considered by all Danes that the war would never have taken place had England and France fulfilled their treaty obligations of 1860 to protect Denmark against spoliation."

On our arrival at Copenhagen, and before entering the Mole, the captain ordered my luggage to be brought on deck, and coldly asked where I would like it conveyed? When he saw that they were addressed to the care of "John Blair, Esq., Chief Engineer of the Danish Government Railways, Aarhuus," his demeanour changed in a moment, and with some interest he enquired whether I was a friend or relative of Mr. Blair? "No," I replied, "but I am going there." Then he remarked, "You are going to a gentleman." His cool reticence seemed to thaw at once into affability, and during the remaining time he was almost genial. As I had some hours to spare before the mail train left Copenhagen for Korsöer in the evening, I asked the proprietor of the hotel to send my luggage on to the station, as I proposed meantime to visit the ramparts, and Thorwalsden's Museum. On observing the address, which by the way was very legibly painted on one of the boxes, I was gratuitously assured by him that the name (J. Blair) was one to conjure with in Denmark.

Copenhagen, as readers of the RAILWAY MAGAZINE are aware, is in the Island of Zeeland, and to cross the Great Belt one must take the train to Korsöer. On my arrival there late at night, I found a gale of wind blowing and the Government paddle steamer, which conveys the mails and passengers to Aarhuus in Jutland, yawing and straining at her moorings as though impatient to do battle with the strife of elements outside. The mate (who superintended the stowing of the mails and luggage) assisted me in my turn across the insecure and badly-lighted gangway which bridged the yawning space between the shore and steamer. When he found I was English he assured me in my own language that he would personally see to my comfort, which he afterwards did, much to my satisfaction. On parting for the night, he inquired whether I knew John Blair? "No." "Well," he continued, "don't leave Aarhuus without making his acquaintance."

On our arrival at Aarhuus, before landing the following morning, the captain, whom I had previously not seen, desired me to tender his regards and services to Mr. Blair. After an early lunch at the Hotel Victoria, I sallied forth well freighted with particulars, directions and injunctions as to how to find Mr. Blair's house. But it being Sunday morning and evidently their church time, the sight of this well laid-out Danish town with its cleanly kept streets, nicely appointed houses, public square, and smartly clad people caused me to lose my way. Having been previously assured at the hotel that any one would show me, I politely asked an old gentleman, who, with his daughter, book in hand, was evidently going towards a cathedral-like building, to show me the way to the address I gave him. He lifted his hat, and smiling, remarked, "Why, that is Mr. Blair's house," and, apologising to his daughter in Danish, took me by the arm and at some inconvenience, I am sure, from the distance walked, at length pointed out the house.

Naturally I wondered, nay, had been wondering for some time, how it was that Mr. Blair was held in such high estimation by the Danes. However, I soon found myself in the presence of one of the best known and most popular men in Denmark at that time. Although many years have since passed, the recollection of the genial smile and frank, hearty reception I received lingers graciously with me, and is still one of my most cherished memories. There is always something about a more than ordinary personality that evades description, for the impressions of one day often yield to those of the following, and the altitudes of human merit and capabilities can only be gauged by the emergencies and experience which call them into being. In height certainly not much, if anything, under six feet, broad and deep in the chest, he was as straight as a northern pine, carrying his greyed head with that "aplomb" that imparts dignity sitting or standing. His face, without being handsome, had been stamped as one of Nature's genuine productions "Hall Marked," and no better certificate was required. His was a development that any tailor could have fitted without padding. Add a pair of searching yet kindly grey eyes, which surely indicated great energy and courage; plainly dressed in a morning coat, which carried an unobtrusive yet significant

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patch of ribbon on the right lappel (of which more anon)—poor limning, and without coloration or side lights, yet John Blair in outline !

I will pass over the four weeks or more which I spent mostly in his company, but which were sufficient to leave no doubt in my mind that he was a born engineer. The poverty of the Danish Government forced him to the exercise and display of such ingenuity to keep things going that he became the head and front of all new plans and departures. In maintenance of stock with humble means and resources he had no superior. But I will deal with those events and circumstances which afterwards endeared him to the hearts of the Danish people. In the year 1864 Denmark was pounced upon by the two great military powers, Prussia and Austria, in what is now historically known as the "Schleswig-Holstein Campaign." The Danes, trusting entirely to the guarantee of England and France of 1860 to preserve their inviolability, were utterly unprepared for war. Their fleet was dismantled and laid up; in several vessels the engines were taken in pieces — nothing in order, and apparently totally incapable of being got to sea in time to meet the combined squadrons of Prussia and Austria. Consternation, almost amounting to panic, prevailed on every hand when Blair, who at that time had an excellently-trained mechanical staff, and had fortunately in his earlier days acquired much marine engine experience in Newcastle and Leith, offered his services to the embarrassed and depleted Navy department. His aid was gratefully accepted.

MR. JOHN BLAIR,
(Order of the Dannebrog, Denmark.)
Late Chief Engineer of the Danish Government Railways.

Night and day he and his staff devoted all their energy and skill to getting the engines and boilers in order to proceed to sea. His indomitable energy seemed to infuse everyone with new life and vigour, the result being that the fleet was got ready for sea just in time to meet, and administer a humiliating lesson to the enemy off Heligoland, thus restricting the war to the Schleswig-Holstein provinces. Nor was this the only service rendered. The railways, which were more immediately under his control, partook of his vigilance and forethought. Every station, depôt and place liable to capture—water supply, coal depôts, and locomotives—was so dealt with as to enable the local staff to obstruct, block, or cripple at the shortest notice. Duplication, and interchangeability of parts, admirable and necessary under peaceable conditions, become a powerful aid in the hands of a vigilant and well-trained enemy. All such engines were withdrawn within the radius of support, and such as were not duplicable were kept within the area of danger. But skilful measures were taken to render them unworkable, or of no use if by chance time was not allowed to withdraw them before seizure. In every possible way this wonderful man sought by his skill and unceasing vigilance to aid in the defence of his adopted country.

Few people now remember the wicked, unprovoked war of 1864, waged by the great military powers of North and South Germany (Austria and Prussia) in their alliance against Denmark for the acquisition of the Duchies of Schleswig and Holstein, with the harbour of Kiel, the finest in Europe, as a base for future naval plans. The defence on the part of the Danes was heroic, and their loss in life and territory great; but it would have been an irremediable catastrophe if the

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fleet had not been able to protect the waterways and the capital. No people are more patriotic than the Danes, and Blair became immensely popular. The late king personally decorated him with the Order of the "Dannebrog" as a public recognition of his services.

The locomotives, as will be seen from the illustration, were well designed, and could not have been better adapted to the conditions of strength of rails and weight of trains for then, as now traffic and roads were the prevailing factors to be considered. Jutland is not thickly populated, and with the exception of the town of Randers, which was devoted to the glove and fancy leather industry, is principally given over to agricultural and pastoral pursuits. There were two types of locomotives in use before my advent—one built by the Canada Works of Birkenhead, the other, smaller ones for passenger service, made by Stephenson's, of Newcastle. It was when examining one of the latter in the company of Mr. Blair that he suddenly remarked (unconsciously relapsing into the broadest Doric), "Ah, hinnie, but these have been cannie engines, and the man who came with them of the canniest. A clever man is Geordie Crow." So it is that inconsequent and seemingly careless items of speech years afterwards shape themselves and ripen into recognition. Both these men justly occupy pedestals in the Walhalla of worthies—a Walhalla which every true man erects and holds sacred for those only who carry the needful attest of being great builders with scanty material, makers of bricks with a paucity of clay and straw.

The locomotives more than justified the character of their builders. After the first two had been put into service, I was courteously informed that the Government were so well satisfied that they would take the remainder over, and that I was at liberty to return to Riga whenever it suited my convenience—a permission I was glad to accept, so as to prepare for the opening of the navigation there. Seven or eight years afterwards, when inspecting the building of new engines for the Midland Railway Company at Robt. Stephenson & Sons, Newcastle-on-Tyne (of which more will be written), I had the good fortune to make the acquaintance of Mr. George Crow, the then Works Manager—the "Cannie Man" of Mr. Blair's mention, and as the two corresponded, I soon had a letter from Blair saying how pleased he was that circumstances had brought the trio in touch.

Mr. Weatherburn's next Contribution will appear in the September issue of the "Railway Magazine."

Photo] [*H. T. Worlock.*

MIDLAND RAILWAY:
4.30 p.m. London—Manchester Restaurant Car Express.
Compound locomotive No. 1038.

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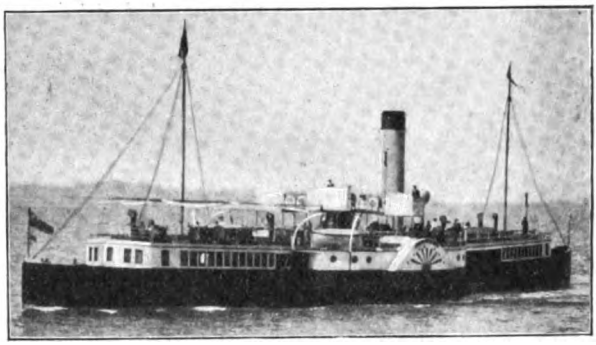
Combined Rail and Boat Excursions on the Great Eastern Railway.

By W. C. GENTRY.



GREAT EASTERN RAILWAY: S.S. *Norfolk*, ON THE ORWELL.

A GLANCE at the map of the Great Eastern Railway will show that this company's system reaches no fewer than twenty seaside towns, and, in addition, serves the Norfolk Broads district and several large estuaries on the East Coast. It is only to be expected that with these opportunities for combined rail and boat excursions, a large number of such bookings should be in force. Your readers know that the Great Eastern Railway Company possesses a large fleet of Royal Mail steamers, which are engaged in the continental services *viâ* Parkeston Quay, Harwich, but these boats do not come within the purview of this article, which is intended to deal only with short pleasure trips. Several steamboat companies work in connection with the railway, but attention must first be given to the River Orwell service, which is maintained by the Great Eastern Company's own fleet of paddle-wheel steamers, The Orwell is the seaward reach or estuarial section of the Suffolk rivulet Gipping, and extends from Ipswich to Felixstowe where, uniting with the estuary of the Stour, it enters the North Sea. The scenery along this river is surprisingly beautiful, particularly if the journey be made during the period of high water. In fact it has been named the "Eastern Wye," and in earlier days frequently gave material to the great painter Constable. A journey by water from Felixstowe to Ipswich is therefore, an experience which will dwell long in the memory.

The Great Eastern Company's Orwell fleet consists of three saloon light-draught paddle steamers—*Essex*, *Norfolk* and *Suffolk* respectively, which have the following dimensions :—

	Length. Feet.	Breadth. Feet.	Gross Tonnage.	Horse Power.
Norfolk ..	184	24	295	850
Suffolk ..	165	21	245	650
Essex ..	175	23	297	672

Although called "river steamers," these boats are very commodious and present, as will be seen from the above illustration, a very pleasing appearance. During the summer months a service of six trips each way is run on week days, with two return trips on Sundays. The journey occupies seventy-five minutes, and calls are made at Pin Mill (where passengers join or leave the steamer by means of small boats, there being no pier or landing stage at this quaint little yachting village) and Harwich, the trip terminating at the Great Eastern Railway Company's Felixstowe Pier, adjoining the Felixstowe Pier station. Throughout return fares by boat only are as follow :—

	Single.		Return.	
Ipswich to Felixstowe	11d. Saloon.	9d. Fore Cabin.	1/4 Saloon.	1/1 Fore Cabin.

It will thus be seen that a pleasant return trip from Felixstowe, giving 2½ hours on the water, with an opportunity of visiting some of the many sights in the ancient town of Ipswich, costs only the modest sum of 1s. 4d. saloon, or 1s. 1d. fore cabin. It need not be stated that the service is exceedingly popular with visitors to Felixstowe, Harwich and Dovercourt as well as with the residents of Ipswich. Combined rail and boat tickets in connection with the service are issued from all stations on the Felixstowe branch line, Ipswich, Westerfield, Dovercourt, Parkeston and Harwich.

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THE *London Belle* AT FRESH WHARF, LONDON BRIDGE.

Southwold, Lowestoft, Gorleston and Great Yarmouth, and along the Kentish Coast to Herne Bay, Margate and Ramsgate. The activities of the Coast Development Corporation are not, however, confined to the running of the Belle steamers. In addition, the company possess piers at Clacton, Walton, Felixstowe, Southwold and Lowestoft.

In connection with the Belle steamers services the Great Eastern Company issue through tickets from Liverpool Street, Fenchurch Street and all suburban stations *viâ* North Woolwich, but such facilities can hardly be referred to as "combined rail and boat excursions," the rail portion of the journey being subsidiary to the boat trip. In like manner, the through tickets issued by the Midland Railway (London Tilbury and Southend section) *viâ* Tilbury in connection with the sailings of the Belle steamers, New Palace steamers (Margate,

Circuit fares from Felixstowe are as follow :—

	Saloon and 1st Class.	Saloon and 3rd Class.	Fore Cabin & 3rd Class.
Felixstowe to Felixstowe *viâ* Ipswich ..	3/–	1/9	1/6
Felixstowe to Felixstowe *viâ* Derby Road ..	2/6	1/6	1/3

In winter the service between Felixstowe, Harwich, and Ipswich consists of two daily trips each way, Sundays excepted. Occasional afternoon sea trips are also run from Ipswich, Harwich, and Felixstowe by the s.s. *Norfolk* during the summer months. In addition to the steamer service, the Great Eastern Company have recently purchased the motor launch *Pin Mill*, which is maintained as a passenger ferry between Felixstowe Dock and Harwich. Five trips each way are made daily, the fare between Felixstowe and Harwich by motor boat or steamer being single 3d., return 4d., 10 to 15 minutes being occupied on the journey.

The Coast Development Corporation Limited, owning the well-known Belle fleet, maintain services during the summer months from London (Fresh Wharf, Greenwich and Woolwich), along the East Coast to Southend, Clacton, Walton, Felixstowe, Ipswich,

PIN MILL, ON THE ORWELL.

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ONE OF THIS YEAR'S CHARACTERISTIC POSTERS: GREAT EASTERN RAILWAY.

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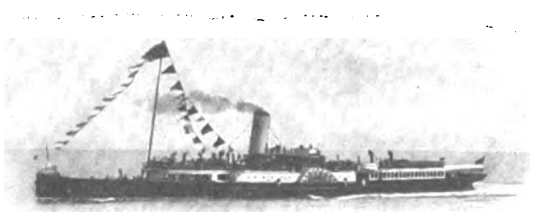
Deal, and Dover) and General Steam Navigation Company (Margate and Dover) are used over the Great Eastern Railway from Fenchurch Street to Gas Factory Junction (where Midland territory is entered) but are to all intents and purposes local to the Midland Company. The following Circuit Tickets are issued by the Belle Steamers and Great Eastern Railway:

Outward journey by Boat, Return journey by Rail, or vice versa.
Down by Boat and back by Train.

Boat Journey.		Rail Journey.		Fare	Availability of Ticket.
From	To	From	To		
London ..	Southend	Southend	London ..	4/-	Day of Issue or Sat. to Mon.
	Clacton ..	Clacton ..		8/6	,, ,, ,, ,,
	Walton ..	Walton ..		8/6	,, ,, ,, ,,
	Felixstowe	Felixstowe		10/-	,, ,, ,, ,,
	Lowestoft	Lowestoft		12/6	Day following date of issue.
	Yarmouth	Yarmouth		12/6	or Fri. or Sat. to Tues.
Clacton ..	Ipswich ..	Ipswich ..	Clacton ..	3/6	Day of issue.
Walton ..	Ipswich ..	Ipswich ..	Walton ..	3/-	,, ,,
Felixstowe	Clacton ..	Clacton ..	Felixstowe	3/6	,, ,,
	Walton ..	Walton ..		3/-	,, ,,
Gorleston ..	Lowestoft	Lowestoft	Gorleston	1/9	,, ,,
Yarmouth	Lowestoft	Lowestoft	Yarmouth	2/-	,, ,,

Occasional trips by the Belle service are made from Ipswich, Felixstowe, Harwich, Walton, and Clacton to Margate and also to Sheerness, Chatham, and Rochester. In conjunction with the Great Eastern and Southwold Railway circular tickets are issued from London to Southwold, available outward by boat and return by rail. This excursion includes a journey over the entire system of the little 3 ft. gauge Southwold Railway. Further north the Great Yarmouth Steam Tug Company maintain a passenger boat service by sea between Yarmouth and Lowestoft. Every week day during the summer the Great Eastern Company combined rail and boat tickets from Yarmouth to Lowestoft, and Lowestoft to Yarmouth available on the outward journey by the Great Yarmouth Steam Tug Co's. steamer, and on the return journey by rail *vid* St. Olaves or Beccles, but not available by the Norfolk and Suffolk Joint Committee's line. The fare for the circular journey is 1s. 9d., third class.

Circular tickets issued in connection with the steamboats over the rivers and broads of Norfolk and Suffolk provide a very complete programme, and to the tourist with a limited time at disposal, it is a matter of some difficulty to chose the most attractive excursion. The Broads and their streams offer about 200 miles of navigable waterways, the three main streams—Yare, Bure and Waveney—uniting at Breydon Water, and entering the North Sea at Gorleston. An accompanying sketch map of the Broads will explain the various routes. On certain days during the summer months cheap circular rail and boat tickets are issued from Lowestoft to Norwich and *vice versa* by the river steamers *Atalanta* and *Lowestoft Belle*, owned by Sterry's River Trips, Ltd. By this service the fare for the round trip is 3s. third class rail. Another and larger steamboat company on the Norfolk Broads is the Yarmouth and Gorleston Steamboat Company, owning the steamers, *Southtown*, *Cobham*, *Yarmouth*, *Gorleston*, *Yarmouth Belle*, *Pride of the Yare*, *Water Fly*. This Company's boats sail regularly during the summer from Yarmouth Bridge to Gorleston (joint service in conjunction with the Pioneer Steamboat Company), St. Olaves, Reedham, Norwich, and Wroxham on the rivers Yare, Bure and Waveney. Without doubt the best way of seeing Broadland if you have only a limited space



THE *Walton Belle* AT SEA.

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of time, is to utilise this company's boats, which are mostly comfortable, though perhaps not palatial.

The Great Eastern Company issue tickets in connection with the Yarmouth and Gorleston Steamboat Company's services as under :—

Down by Train and Back by Boat.
London to Yarmouth and Lowestoft, fares, etc., as above.

From Yarmouth.	1st class.	3rd class.
Yarmouth to Wroxham by boat Wroxham to Norwich by rail *Norwich to Yarmouth by rail	4/6	2/9
Yarmouth to Norwich by boat Norwich to Yarmouth by rail	4/-	2/6
Yarmouth to Norwich by rail *Norwich to Wroxham by rail Wroxham to Yarmouth by boat	4/6 (Special afternoon trip).	2/9
Yarmouth to Wroxham by boat *Wroxham to Norwich by rail Norwich to Yarmouth by boat	4/6	3/-

* Sufficient time is allowed in Norwich to visit Cathedral.

By the last named trip an excellent opportunity is afforded for seeing both the Yare and Bure (about 65 miles of river scenery) in one day, at the small fare of 3s. Time is also given by the trip to visit the famous Norwich Cathedral. The Great Eastern Company's excursion programme mentions the fact that Wroxham Bridge is four minutes walk from Wroxham station ; and, as the connections between train and boat are timed rather closely, it is not advisable to spend too much time in buying picture postcards in Wroxham village. From Lowestoft the foregoing list of excursions are in operation at slightly higher fares, the journey between Lowestoft and Yarmouth being made by rail, while afternoon excursions by boat and rail *viâ* the river Bure or river Yare are also run from Norwich to Yarmouth and back. Similar facilities are in operation from Wroxham, North Walsham and Cromer.

It will thus be seen that complete arrangements have been made by the Great Eastern Railway and the Yarmouth and Gorleston Steamboat Company to enable visitors at Lowestoft, Yarmouth, Cromer, North Walsham and Norwich to see the rivers and Broads at remarkably reasonable fares. For instance, a visitor to Lowestoft can for the modest sum of 4s. 3d. see the river Bure between Yarmouth and Wroxham, including the principal Broads, spend an hour in Norwich admiring the Cathedral and Castle, travel back over the river Yare and Breydon Water to Yarmouth, spend two and a half hours in that town, and finally return from Yarmouth to Lowestoft by the last train—all without any unnecessary hurry.

From Cromer another combined rail and boat excursion is advertised in connection with Mr. Smith's popular motor launches which leave the "Three Horseshoes" Hotel, Staithe (*i.e.*, local name for landing place or narrow creek) at Wroxham twice daily—a morning trip to Coltishall and back, and an afternoon trip round Wroxham and Salhouse Broads, through Horning Village to Ranworth Broad and back to Wroxham. The combined fare for each trip is 3s. (third class rail). Passengers may return the same day from Wroxham to Cromer by any train.

In the foregoing a summary has been given of the through booking arrangements in force by rail and boat, but in addition there are in the district several steamer services which holiday makers on the system served by the Great Eastern Railway will find enjoyable and cheap. Among these may be mentioned the following :—

From Yarmouth to	*Company or Steamer.*
Reedham ..	.. Y. & G.S.B. Co.
St. Olaves	.. ,, ,,
Gorleston ..	.. Y. & G.S.B. and P.S.B. Co. Junction.
Burgh Castle	.. Pioneer S.B.Co.
Cromer ..	.. s.s. *United Service.*
From Hunstanton to	
Skegness ..	.. s.s. *Privateer.*
From Maldon to	
Osea Island	.. Steam Launch.
Stangate Abbey	.. ,, ,,
From Southend to	
Chatham ..	.. Medway S.P. Co.
Rochester ..	.. ,, ,,
Strood ..	.. ,, ,,
Sheerness ..	.. ,, and s.s. *Duke of Abercorn.*
Herne Bay	.. Belle Steamers.
Margate ..	.. Belle Co., New Palace Co.,
Ramsgate ..	.. and General Steam Nav. Co.
Dover ..	.. N.P.S. Co. and G.S.N. Co.
Deal ..	.. New Palace Steamers, Ltd.

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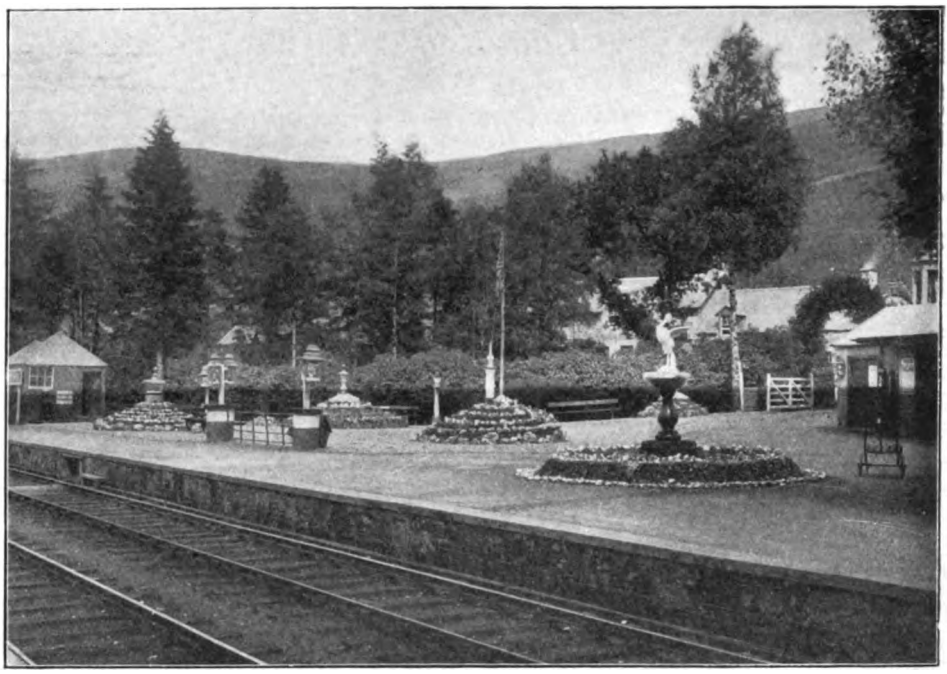

STRATHYRE STATION: CALEDONIAN RAILWAY.

Premiums for Best Kept Stations on Scottish Railways.

By JAMES ROMANS.

THAT many of the great railway companies of the United Kingdom annually spend considerable sums of money in giving prizes for the best kept stations on their respective systems is not, I feel sure, well known among the travelling public; but it will be admitted that many of the railway stations in this country present quite an attractive appearance. Particularly is this noticeable at country stations and stations in the suburbs of large towns, where, as a rule, flowers are liberally used. It is, of course, part of the duty of the staff at a station to see that it is at all times kept as clean and tidy as circumstances permit, but in order to obtain one of the prizes referred to, it is essential that something more should be done than what is absolutely necessary to comply with such regulations. The idea of awarding such premiums is not altogether a new one, but has been in vogue for a number of years, and I propose to deal with the subject as far as the stations of the Scottish railways are concerned.

Readers of the RAILWAY MAGAZINE know that there are five important railway companies in Scotland—the Caledonian, Glasgow and South Western, North British, Highland, and Great North of Scotland. For the purposes of this article only the three first mentioned have to be considered, the Great North and Highland Companies not having yet encouraged their stafls by offering prizes for the condition in which their stations are kept. The company which was first to institute the practice in the Northern kingdom, and which consequently has had more experience of its working than any of the others, is the North British. It is over twenty years since this company first considered the advisability of offering such premiums, no less than £240 was distributed in prizes in the first year's competition. In making the initial intimation to the staff on the subject, on January 25, 1892, the General Manager stated that the prizes were offered as "an additional inducement to station masters to improve the appearance of their stations."

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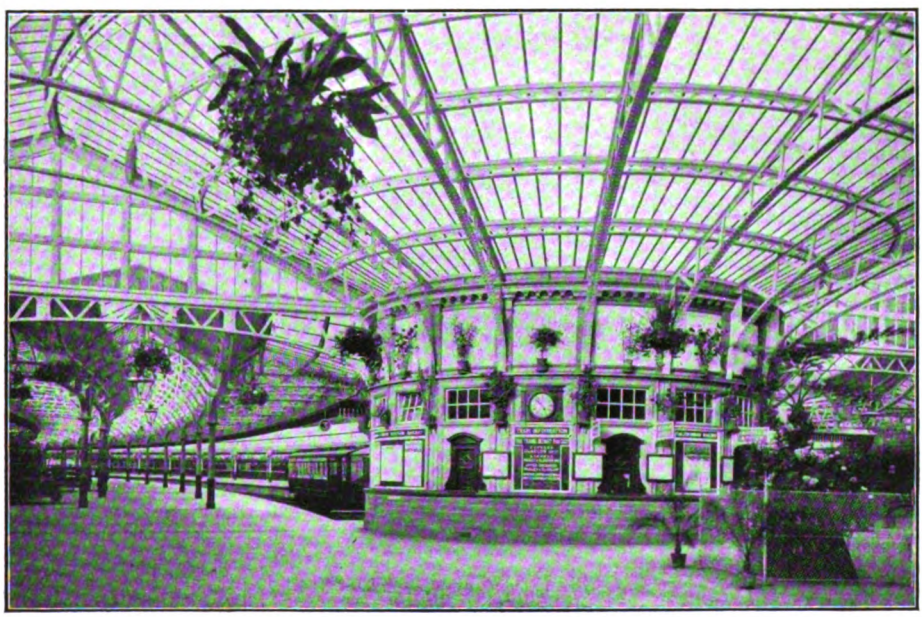
More interest seems to have been at once displayed in matters of perhaps lesser importance, but still things which go to the comfort and convenience of travellers. The awards of the company in 1892 were divided into four classes. Ten stations receiving the largest number of marks were called first class, and each obtained a prize of £5; the next twenty were regarded as second class, and received £4 each; the following thirty, third class, each obtained £2; the next fifty each received £1, this being the award for the fourth class. Thus 110 stations participated in the first year's awards.

Whereas up to the allocation of the prizes for the year 1910, four marks were allowed under each head at stations where proficiency had been attained, the number of marks now varies according to the importance of the matters dealt with. The subjects and marks allowed under each is as follow:—General condition of passenger station and of goods station also, when both are in charge of the agent (18); orderly arrangements on platforms (16); condition of waiting rooms and offices (12); neatness in exhibition of timetables, bills and notices, also advertising contractors' advertisements (10); cleanliness of windows and lamps (10); cleanliness and smartness of staff at passenger station (12); condition of water closets, etc. (12); cultivation of flowers and shrubs (10). Each station is visited by an inspector on one or more occasions during the months of May, June and July, when the stations and particularly the floral decorations should be at their best. In 1896, when the number of stations obtaining full marks exceeded the number of prizes offered in that class—although such had then been increased to twenty—the stipulation was made that winners of a first class prize in any one year were not to be entitled to take either a first or second class prize the following year, while winners of second or third class premiums were not to get a premium of the same class the next year. A few years later, for the same reason, additional opportunities were afforded the selectors to give the highest premiums to the most deserving stations by taking into consideration amongst other matters incivility or inattention on the part of the staff; and failure to exercise economy in the use of stores, water and gas. The number of prizes now offered by this company is 200, and the total value of the same (£400) is alloted as follows:—twenty first class premiums at £4 each; forty second class premiums at £3 each; sixty



WEMYSS BAY STATION, CALEDONIAN RAILWAY.
Glazed on the "Eclipse" patent system by Messrs. Mellowes & Co., Ltd., Sheffield and London. Roof area 50,000 square feet.

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third class premiums at £2 each; eighty fourth class premiums at £1 each.

The Glasgow and South Western Company was the second in Scotland to promote a similar competition among their stations, the allowance for prizes in the first year (1898) being fixed at £50. The money was divided into eighteen prizes—three at £5; five at £3; and ten at £2. Like that of the North British the competition is open to all the stations on the system, but only stations where the agents have intimated their desire to compete are inspected for this purpose. Prizes are offered more especially for the best kept and most attractive flower gardens or borders, although the general tidy appearance of the station is also taken into consideration, and a stipulation is made that no seedmen's advertisements are to be displayed in connection with the gardens or borders. The experience of this company is much the same as that of the North British. The amount allowed in prizes commencing with the current year is £150 divided into five classes—12 at £5, 10 at £4, 10 at £3, 5 at £2, and 10 at £1.

A few years after the commencement of the competition, it was found that the same stations were frequently winning the first and second class prizes, and to avoid this result it was then arranged that the winner of a first class prize in any one year should be barred from the same prize the following year, and the winner of a second class prize in two consecutive years was not allowed to take the same prize the next year. This method was somewhat altered in 1910, but for the purposes of this year's competition has been dropped.

The Caledonian Company were late in instituting a like practice. It was, in fact, only in 1908 that their first competition took place, but they then offered the substantial sum of £350 for annual distribution among the 140 stations which showed the best results. The winning stations are also divided into classes and receive premiums as follows:—Twenty first class premiums at £5 each; thirty second class premiums at £4 each; forty third class premiums at £2 each; fifty fourth class premiums at £1 each. This company's scheme is more on the lines of the North British than is that of the Glasgow and South Western Company, inasmuch as every station is entered for the competition without having to intimate their desire to do so, and the subjects dealt with are similar.

There are eleven heads under which marks are allowed, eight of them being similar to those in use on the North British

BANNOCKBURN STATION: CALEDONIAN RAILWAY.

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and a ninth deals with the position allocated to advertising bills. The remaining two pertain to economy in use of light and stores; but instead of having a total of 100 marks this company now allows a total of 550, *i.e.*, fifty under each head, which allows more scope to the inspectors to withhold marks from a station which, even to a very small degree, falls short of what may be expected. The awards are made on the percentage of marks gained, and this company differs from the others to the extent that stations which are not adapted for the cultivation of flowers tain stations are debarred altogether from competing for one year.

Most people are familiar with the stereotyped forms which decorations at railway stations assume, such as borders of flowers or shrubs alongside the station fences or on the banks, beds of flowers on the platforms, and, where the station is covered in, baskets of flowers hanging from the girder rods. Then there is the practice—not quite so common perhaps, but still frequently resorted to—of having the name of the station laid out in flowers, small stones or shells. There are, however, a

THORNTONHALL STATION: CALEDONIAN RAILWAY.

have their percentage of marks based on a possible of 500 in place of 550, thus making it possible for a station like the Central, in Glasgow, to take a place amongst the first class prize winners. In other respects the Caledonian scheme is similar to that of the North British, except that the former, although adopting the same idea as the latter for the first year's competition with regard to the debarring of winners in any one year from obtaining prizes of the same class the following year, have now changed this to the method in vogue on the Glasgow and South Western Railway, whereby cer-

number of stations where some ingenuity is displayed and an article on this subject would be incomplete without containing a few illustrations of the same. Pride of place might be given to Bannockburn station on the Caledonian Railway, where a unique design is cut out of the turf on a high part of the bank,—a drawing of which is here reproduced. This is of special interest because of its connection with Scottish history.

The figures are supposed to represent Wallace and Bruce, the top numbers (1314) being the date of the battle of Bannock-

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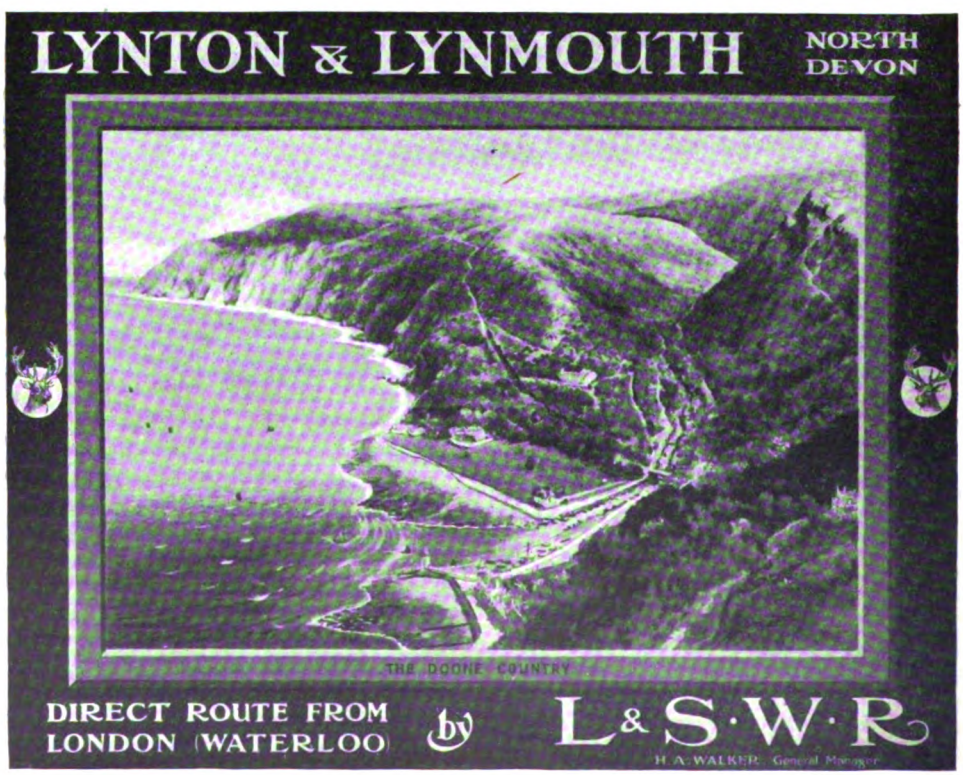
burn, the letters "S" and "C" the name of the original Railway Company (the Scottish Central), and 1848 the date upon which the line was open for traffic. At Strathyre station, quite different features are displayed. The boundary palings are covered with a fine show of tall nasturtiums (mixed) and a number of white quartz rockeries about 10 ft. to 12 ft. broad at base, tapering up in tiers to a height of over 4 ft. are built on the platform, the spaces between the stones being planted with blue lobelia and bright scarlet dwarf nasturtiums. There is also on the platform a granite fountain, with white quartz basin, the top being adorned with a statue of a stork with water playing upwards from its bill.

A view of Thorntonhall station is given, and it might be mentioned that Mr. Stott, the stationmaster has several times gained a first prize. Attention must also be drawn to Wemyss Bay station as it is the only one on the Caledonian system which in 1911 obtained the full 100 per cent. of marks.

The roofs are covered with "Eclipse" Patent Glazing, of which Messrs. Mellowes & Co., Ltd., Sheffield and London, are the patentees and sole manufacturers. Their special section consists of a strong, yet light steel tee, which is enveloped in a lead cover, the ends of which are soldered, thereby sealing the steel from the atmosphere, and preventing any possibility of rusting. The lead cover has three separate lead webs or flanges, two of which are rubbed down on to the glass from the outside of the roof, and the third up to the glass from the underneath, thereby rendering the glazing perfectly weather tight and dustproof. By this means the maximum of light is obtained with a strong yet light section. The all-important advantage of "Eclipse" patent glazing is that it requires no maintenance, the initial cost being the one and only outlay, "Eclipse" glazing erected 30 years ago being almost as good to-day as when originally fixed. Cupar station, in the Kingdom of Fife, is another which looks very well. The high bank is tastefully laid out, and is invariably well kept.



ANOTHER STRIKING SCENIC POSTER ISSUED BY THE LONDON AND SOUTH WESTERN RAILWAY.

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Excursions on The Great North of Scotland Railway.

By G. W. J. POTTER.

Photo] [*A. J. Chisholm.*

TRAIN APPROACHING CULLEN.

IN the north-eastern quarter of Scotland the Great North of Scotland Railway occupies a position somewhat analogous to that of the North Eastern Railway in England. In each case the territory owned and worked is largely a monopolist area, and the combination of inland and seaside branches is common to the two companies. The Great North has to face a certain amount of competition from the seaports on the East Coast, and from the Highland Railway on its north-western border; but otherwise it possesses the counties of Aberdeen and Banff virtually to itself, and makes a very good showing in Elgin, comparing with the North Eastern's exclusive position in Northumberland, Durham, and the greater part of Yorkshire. Another resemblance is the way in which the Scottish company lays itself out to run long distance excursion trains at a cheap rate. Further, it has greatly developed the road motor traffic—both of which schemes are practised by the North Eastern Railway.

Aberdeen is the headquarters of the Great North, which system has been described as "Little and Good," and judging only from the excursion facilities which are provided, both from that city and from other centres, the railway still merits that appropriate epithet. A neat little booklet is issued by the company giving the programme of the fixed day and half-day excursions which are run throughout the summer months (from June to the end of September). Certain of these tickets may be obtained daily, but others are issued only on Wednesdays, Thursdays, and Saturdays. The limits prescribed for this article do not permit an extended review of all the facilities provided by the Great North authorities, and attention will, therefore, be confined to trips from Aberdeen, and in particular that known as the "Speyside Excursion." This is perhaps the best value for money of any, as it gives the traveller the opportunity of seeing a considerable portion of the main line

Photo] [*A. J. Chisolm.*

INVERURIE STATION.

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Photo] [A. J. Chisholm.

0-4-0 TANK ENGINE AT ELGIN.

of the Great North, and the route lies from end to end through a very picturesque country. Compared with the other cheap excursions on the basis of mileage only, this easily comes out first, for the distance from Aberdeen to Boat of Garten is 101¼ miles, or 202½ miles for 2s. 6d., a fraction short of 6½ miles of travelling for the sum of one penny. Surely this should satisfy the demands of the most exacting railway enthusiast.

Other people, however, think that the time allowed at the terminal point should be the chief consideration when holiday-making. Well, the Great North have allowed 4½ hours between arrival and departure at Boat of Garten during the months of June, July, and August, with, of course, a relatively longer period at stations which are nearer Aberdeen. Thus at Craigellachie there is an additional two hours available. During September the time of the return train is fixed one hour earlier, but this causes little inconvenience as by 7 o'clock in the middle of that month it is getting dusk, and there is little to do or see at that quiet healthful village surrounded by the heather-clad hills.

The annexed table of the excursions which are run from Aberdeen gives some idea of the facilities provided in the way of cheap travel from this important centre. Such privileges are, as a rule, restricted to Saturdays, but the Speyside and Ballater trips are run on Wednesdays, also, and cheap tickets to Cruden Bay are issued daily during the season.

Luncheon is served on the train at the moderate price of 2s., provided notice has been given to the Passenger Superintendent on the morning of the day of the trip. Cycles are carried at special rates by this and most of the other excursions. Passengers travelling to Speyside on Saturday can return to Aberdeen on the following Monday on payment of 2s. 6d. extra. The return fare to any station served by this train is 2s. 6d. From the beginning of July the Moray Firth Coast and the fine old cathedral city of Elgin may be visited by excursion on Wednesdays and Saturdays. The route taken is by the main line (as in the case of the Strathspey trains) as far as Cairnie Junction, whence they turn northwards to Tillynaught Junction. Here diverges the short branch to Banff, to which passengers are booked. The train continues by the sea coast to Portsoy, Cullen, Buckie, Fochabers, Garmouth, and Elgin, the fares being 3s. to Garmouth or Elgin and 2s. 6d. to any of the other specified stations.

There are trips to the Upper Deeside on Wednesday and Saturday, 1s. 3d. being charged to Banchory (16¾ miles), 1s. 6d. to Torphins (22¾ miles), 2s. to Aboyne (32¼ miles), and 2s. 6d. to Ballater (43¼ miles). On Wednesday and Saturday Lower Deeside has a train to itself, terminating at

District.	Stations.	Day.	Fare.	Miles.
Speyside	Dufftown to Boat of Garten ..	W. & S.	2/6	101¼
*Moray Firth Coast ..	Banff to Elgin	W. & S.	2/6 — 3/-	87¼
Upper Deeside ..	Banchory to Ballater	W. & S.	1/3 — 2/6	43¼
Lower Deeside ..	Drum to Banchory	W. & S.	1/-	16¾
Vale of Alford ..	Kenmay to Alford	S.	1/- — 1/6	29¼
Donside	Kinaldie to Inverurie	W. & S.	1/-	16¾
Buchan	Newmachar to Boddam	W. & S.	1/- — 2/-	35
Cruden Bay ..		Daily.	2/6	29¼

* Does not run in June.

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Banchory, the charge being 1s. to any of the four stations mentioned.

The Deeside line has a character of its own, as it is detached from the rest of the system. Other Great North trains run northward from the joint station at Aberdeen, but the Ballater and Deeside trains leave as if they were bound southward for Perth and London, and at Ferryhill Junction turn westwards along the valley of the Dee.

The Vale of Alford trip is the next to be noticed. This leaves the main line at Kintore, and all stations on the branch are served at prices varying from 1s. to 1s. 6d. Three stations in Donside—Kinaldie, Kintore, and Inverurie—have the luxury of a Wednesday and Saturday trip at the cost of 1s. The last of the trips is that which serves the district of Buchan on Wednesday and Saturday. By this train one can visit Newmachar, Udny, or Ellon for 1s., Hatton or Cruden Bay for 1s. 6d., and Longhaven or Boddam for 2s. By payment of 1s. golfers obtain at Cruden Bay the use of the celebrated course which is owned by the railway company. Daily trips are run to Cruden Bay, either with or without the privilege of a round on the course, and with the option of electric car to the hotel and luncheon in that palatial building.

Reference to a map will show that excursion facilities are granted over virtually four-fifths of the Great North system. Many of these excursion trains are booked to run at a good speed, often equal to, if not better than, that prescribed for the ordinary passenger service. The log of a trip with the Strathspey excursion may here be reproduced. One Wednesday in September the train, comprising three eight-wheelers and five six-wheelers was drawn by No. 36, a four-coupled bogie engine. Owing to the approach of the close of the season, there was only a comparatively small number of passengers in the train, but a merry party filled the saloon which formed one of the vehicles. Aberdeen was left at 1.1 p.m., a minute late, and the driver got away in fine style, though a few signals had to be whistled down before Dyce (6¼ miles) was cleared at 1.12. Kintore (13¼) was passed at 1.19.40, Inveramsay (20½) at 1.28, and Huntly (40¾) at 1.52.10. From Aberdeen to Huntly is the longest run without stop which is made by Great North of Scotland trains, 40¾ miles in 59 minutes, though our time, it will be seen, took but 51 minutes 10 seconds. One train each way has this 59 minute booking, but the down is burdened with no less than five conditional stops, and the up with one. So that presumably this "non-stop" run is not often realised.

Keith (53¼) was passed by at 2.4.20 and thenceforward the journey was along a single line track. Dufftown was reached at 2.19.25 (due 2.21) giving a journey speed of 49·07 miles per hour. This was the first stop, 64 miles from Aberdeen, as compared with the usual run of 40¾ miles to Huntly. Leaving a bare minute later (2.20.20) we ran into Craigellachie at 2.27, representing a gain of three minutes on the booked timing. Considerable delay occurred here as the result of an axle having run hot, but we left at 2.42.20, and after somewhat long waits at Ballindalloch and Grantown arrived at Boat of Garten, our destination, at 3.44.10 instead of 3.30. Altogether this was a very creditable performance for quite 5 minutes would have been saved in the stops and fully 10 minutes was lost at Craigellachie. The return trip was made by the same engine, but the load hauled was only two eight-wheelers and three six-wheelers. Boat of Garten was left half a minute behind time, and waiting for the train in the opposite direction cost us 9 minutes at Grantown. Extra stops at Cromdale and Auchindachy added fully 7 minutes. Hence the latter station was not left till 8.27. Nevertheless we came to a stand at Aberdeen at 9.38.55, instead of 9.42. This gave a journey speed of 51·92 miles per hour for the last run of 56¾ miles. Readers of the RAILWAY MAGAZINE will, I think, join me in congratulating the Great North of Scotland authorities upon such good work, and hope that they may long merit the praiseworthy title of "Little and Good" as applied to this well-managed railway.

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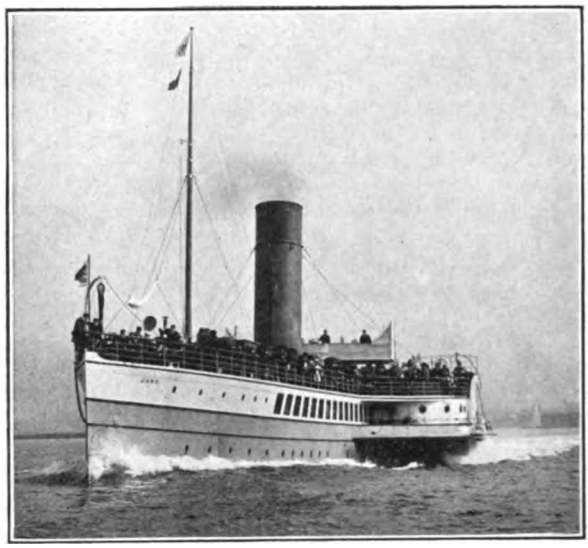
Coast Services of the Glasgow and South Western Railway.



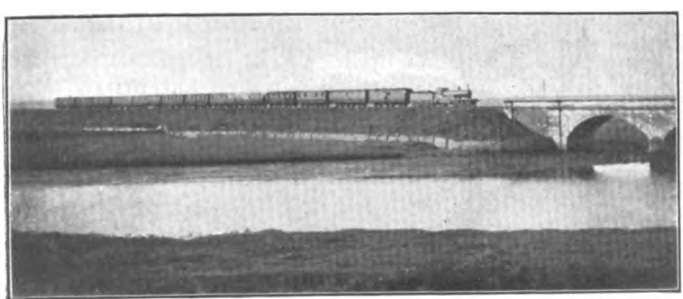
Maclure, Macdonald & Co.] [*Glasgow.*

GLASGOW AND SOUTH WESTERN RAILWAY STEAMER *Juno.*

A PECULIARITY of the railway situation in Scotland, particularly in the south-western counties, is the curious combination of competition and co-operation between various lines. Each company endeavours to outvie its competitors in respect of celerity and convenience of train, steamer and associated services, and at the same time, by interchange and other arrangements, to give passengers the benefit of all possible train and steamer routes and services, as well as including many of the privately-owned steamer services, and, in the case of circular tours, coach and motor vehicle tours. As a holiday ground the Firth of Clyde, with its associated lochs, is unique; and in the aggregate it has perhaps the most remarkable series of steamer services in the world. Indeed, the steamers, particularly those belonging to the railway companies, run as punctually as the trains; and apart from their holiday traffic, many are systematically used by season ticket holders travelling to and from Glasgow daily or several times a week.

In respect of combined rail and steamer services the Glasgow and South Western Railway—familiarly known as the "South Western"—takes a leading place. Of its fleet of ten vessels, seven (including the *Atalanta* turbine steamer) ply mainly to or from Greenock; the *Glen Sannox* runs between Ardrossan and Arran; the *Juno* serves various piers, usually on special excursions and tours; and the *Troon* is occupied as a tug at Troon harbour. Many of the other steamers seen on the Firth of Clyde—including Caledonian and North British Railway vessels as well as privately-owned turbine and other boats—are associated with the Glasgow and South Western services; while from Ardrossan, Greenock, Ayr, Troon, Stranraer and Portpatrick, steamers go to various ports in Ireland, the Isle of Man and England.

Although other lines reach the sea shore at a few points, the Glasgow and South Western is essentially the coast railway



Photo] [*R. A. Chrystal.*

GLASGOW AND SOUTH WESTERN RAILWAY TRAIN PASSING IRVINE CAMP.

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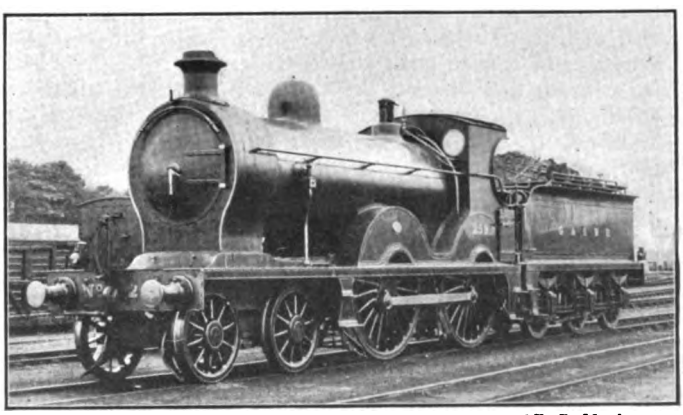
of this section of Scotland. The Greenock line carries the bulk of the steamship traffic, but the section from the Ayr line at Kilwinning to Ardrossan (short branch to Ardrossan Pier), Fairlie (short branch to Fairlie Pier), and Largs, takes many passengers, and at Ayr, Troon and the terminus of the Portpatrick and Wigtownshire Joint Railways other services are dealt with. Another feature of Glasgow and South Western traffic is the large number of fast, semi-fast and non-stop trains run daily from St. Enoch to Greenock, Ardrossan and Fairlie in connection with the steamers. Involving a long climb, with long severe grades to cross the high land overlooking Port Glasgow, the Greenock line is a very hard one. Consequently very fine work is called for, frequently with heavy loads, to cover the 25½ miles from St. Enoch to Princes Pier (Greenock) in 42 min. without stop, or a few minutes longer if one or more stops are included.

The 8.20, 10.5 a.m., 12.5, 1.3 (Saturdays only), 1.53 (Saturdays only), 1.58 (Saturdays only), 2.5 (not Saturdays), 4.3, 5.0 (not Saturdays), 5.45 and 7.35 p.m. expresses, and the 7.35, 10.35 a.m. and 12.16, 2.40, 4.12 (not Saturdays), 6.5. 8.0, and 10.5 stopping or semi-fast trains from St. Enoch to Greenock all connect with steamers. Duplicate Saturday afternoon expresses at 1.53 and 1.58, both non-stop to Greenock in 42 min., indicate the volume of the traffic at that period. In conjunction with these trains are railway steamers to Rothesay—the "Brighton" of the Clyde—Dunoon, Ormidale, Arrochar, Kilmun, Garelochhead, Clynder, Blairmore, Lochgoilhead and other resorts; round the Kyles of Bute and on special routes; while private steamers for Campbeltown, Inveraray, Ardrishaig, and other places north and south along the Firth and associated lochs produce a wonderful array of facilities. But even these are not enough, notwithstanding that one may often see three, four or five vessels waiting trains at Princes Pier, and Rothesay or other centres where interchange arrangements are in force, when Glasgow goes holiday-making, and during the peculiarly Scottish "month-end" migrations. Every vessel which can be pressed into service is then employed, and trains duplicated and added to in a remarkable fashion. Steamers are used for day excursions, for travel to and from holiday resorts, and for afternoon and evening cruises to an extent which enables one to realise the wonderful favour which the Clyde Estuary enjoys among Glaswegians.

Other services may be briefly mentioned. The 8.15 a.m. from St. Enoch to Ardrossan Pier connects with a daylight steamer to Portrush; while the "short route" to the Isle of Man from Ardrossan Pier is served according to date by the 10.20 and 11.0 a.m., or 11.0 p.m. train from St. Enoch. Leaving St. Enoch by the 9.20 a.m. express to Fairlie Pier one obtains the quickest service to Campbeltown, whence the light railway crosses the Mull of Kintyre to Machrihanish. To Ardrossan Pier the 9.5, a.m., 12.28 (not Saturdays), 1.55 (Saturdays only), 4.55 and 7.45 (Saturdays only) trains, connect with steamers for Arran, and to Fairlie Pier, the 9.20 and 11.35 a.m., and 2.0, 5.20, and 9.5 p.m. (Saturdays only) trains, connect with steamers to Millport, Kilchattan Bay, etc. Many of these trains are express or semi-fast, and their working calls for good locomotive performance on the part of the 4–4–0 engines which work so large a proportion of Glasgow and South Western traffic of all kinds. There are also the Stranraer boat trains from and to Glasgow for the short route to Ireland, many special circular and other tours and excursions involving train and steamer or train, steamer and coach travel from the piers mentioned, as well as from Ayr, Troon, Largs and other places.



Photo] [*F. E. Mackay.*

GLASGOW AND SOUTH WESTERN RAILWAY LOCOMOTIVE EMPLOYED ON CLYDE COAST SERVICES.

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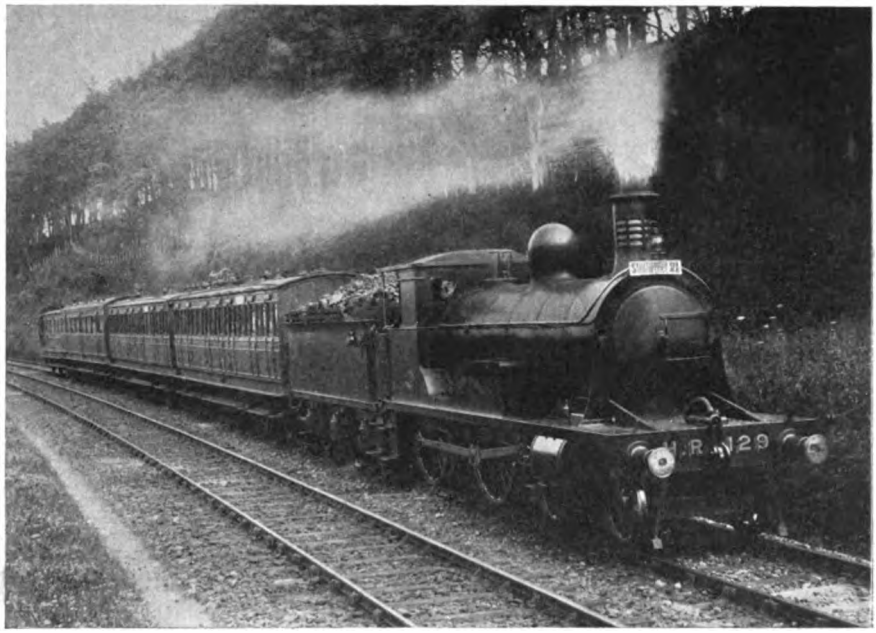

J. Thomson] [*Inverness.*

THE STRATHPEFFER SPA EXPRESS : HIGHLAND RAILWAY.

Strathpeffer Spa as a Health and Holiday Resort.

DURING the months of July, August and September, the "Strathpeffer Spa" express train runs every Tuesday on the Highland Railway from Aviemore, in connection with the morning trains from Glasgow, Edinburgh, Dundee and other stations. It has been said that at Strathpeffer Spa "Nature in her glorious majesty holds court, and grants the boon of health and happiness to all who come." The claim is not an idle one, and all who visit this home of natural beauty and robust health are eager to go there again and again. Truly ideal is the holiday that the famous Scottish Spa affords. Many of us are apt to rush away to places more or less remote in Continental climes, and it is hardly surprising to learn that one of the hygienic spots on the northern slopes of the Pyrenees attracts in a single year as many as 40,000 people, tempted there no doubt partly by the gaiety of the local life, but in large measure because of the healing virtues of its sulphur streams. But at Strathpeffer—easily and comfortably reached from the Metropolis in the through carriage from Euston during the season, and in handsomely-appointed trains by other routes—one finds there the strongest sulphur springs in the United Kingdom, by many chemical authorities regarded as being only second in medicinal value to those in the north of New Zealand, which were long since admitted to be the finest in the world.

Strathpeffer is the strath or valley of the "Peffery," a little stream that enters the sea at Dingwall. In the valley within recent years a pretty modern village occupies a situation that is unique. To the north towers the great bulk of Ben Wyvis, rising to a height of 3,429 ft., and shutting off effectually the cold boreal blasts. On the other side the strath is bounded by the abruptly-rising, finely-wooded peak of Knockfarrel, lower in elevation, but forming a picturesque feature in the landscape, and providing a capital climb for enthusiasts. Between these two mountain-masses, stretches out a lovely valley, with little farms and white-washed cottar-houses dotted here and there, and the finely-built, handsomely laid-out spa nestling in the centre. It is truly a romantic spot, literally an ideal place for a holiday. Dingwall, half an hour's run from Inverness along the northern main line of the Highland Railway, is a town with a fascinating

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J. Thomson] [*Inverness.*

THE PUMP ROOM: STRATHPEFFER SPA.

history. Thence the through trains go to Wick (for John o' Groat's House) and Thurso (for the Orkney and Shetland Isles), or westward to Kyle of Lochalsh. Here the steamers for Portree and Stornoway await the mid-day train; but travellers are recommended to stay at the Station Hotel for a day or two, after applying for rooms in advance. Within 5 min. journey by steam launch, lies Skye, the Isle of the Mist, famous for fishing, for scenery, for historic interest and romance. Strathpeffer is reached by a branch service from Dingwall, in some cases with through carriages from Inverness, or by through trains. The station is one of the prettiest on the system. In addition to its own attractions Strathpeffer is a good centre, brakes and *char-à-banc* conveying parties at trifling cost to numerous attractive "sights," while excellent roads provide exercise for the pedestrian, or for cycling and motor tours.

There are five different wells at Strathpeffer, and many maladies have been cured by those who have drank their waters. The best specimens of sulphur and chalybeate springs give forth their supplies in abundance, and, besides being distinctly remedial in its properties, the latter possesses the rare advantage of a palatable flavour by reason of the fact that it blends in suitable proportions carbonate of iron, carbonate of lime, and chloride of sodium. The Spa is now controlled by a syndicate of eminent men—scientists and others—who have spared no effort to provide for the comfort, health, and amusement of visitors. All the springs have been carefully collected, and brought to a central pump-room, immediately opposite to, and overlooked by, the magnificent new Highland Railway Hotel, one of the best-equipped, most up-to-date, and best-managed establishments in the United Kingdom. Burns wrote:

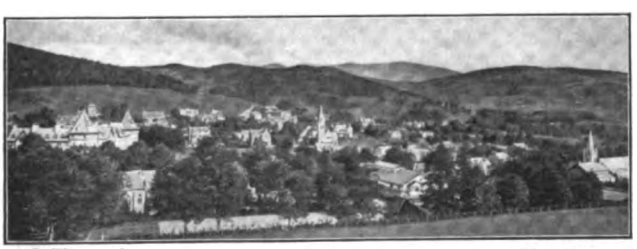
"In Heaven itself I'll ask no more
Than just a Highland welcome."

And this the visitor may rely upon at the "Highland Hotel," Strathpeffer.

J. Thomson] [*Inverness.*

HIGHLAND RAILWAY HOTEL: STRATHPEFFER SPA.

The Highland Railway Company's Official A.B.C. Tourist Guide to the Highlands of Scotland, of which a new edition is now available, is an excellent publication. While affording all necessary information concerning facilities, circular tours, tourist, ordinary and excursion arrangements, it gives full particulars concerning the numerous golf courses and open fishings, and includes a comprehensive review of the system, with many items of interest concerning the railway itself, its history and development. The various resorts served are dealt with alphabetically, and numerous illustrations are added of popular resorts, engineering works, trains, locomotives, and views on the line. Pamphlets dealing with the golf courses served by the railway and with Strathpeffer Spa are also available. Copies of all these may be had on application to Mr. T. McEwen, Traffic Manager, Highland Railway, Inverness.



J. Thomson] [*Inverness.*

GENERAL VIEW OF STRATHPEFFER.

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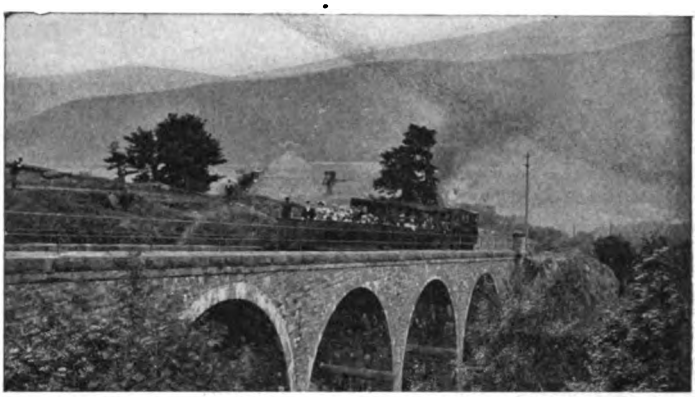
Snowdon Mountain Rack Railway.



SINCE its opening in 1896 this railway has enabled thousands of visitors to reach the summit of Snowdon, the highest mountain in England or Wales. Built on the system in use on the Alpine Railways, the line is the only one of its kind in the British Isles. The gauge is 2 ft. 7½ in., the length 4⅝ miles, the total rise from the terminus at Llanberis to the summit of Snowdon 3,140 ft., the steepest gradient 1 ft. in 5½, and there is no sharper curve than about 260 ft. radius, as against some in Switzerland of 100 ft. radius. Powerful locomotives are employed, and each carries four steel pinions, which engage with the double steel rack laid between the rails, enabling the train to be propelled in front. Whether ascending or descending the engine is always below the train. When making the journey the carriages are not at any time attached to the locomotive, and the railway has been so constructed that there is a certain amount of gradient the whole way from Llanberis to the summit. On the ascent the carriages are pushed, and on the descent they simply follow the locomotive, the reason of this arrangement being, that should any accident occur to the engine, the guard, by the use of a strong hand brake, is able to stop the carriage at any moment. The mechanism on the engines and coaches converts the rack and pinion into a powerful brake, and if the fixed speed of 4 miles per hour were exceeded this brake would automatically bring the train to a standstill. There are five separate brakes on the train, each capable of stopping it immediately.

Visitors who arrive at Llanberis by the London and North Western Railway have no difficulty in finding the pretty terminus of the Rack Railway, built in Swiss chalét style, and fitted with the usual equipment of a modern railway station, including a first-class refreshment and tea-room. The trip up the mountain begins with a straight run westward along a gradient of 1 in 50 for about 300 yards, crossing the river Afon Hwch, and bringing the train to the bottom of a fine masonry viaduct of 14 arches, each of 30 ft. span. Thence the gradient is 1 in 8½, and the passenger soon realises how smoothly the train moves on a steep gradient. From the viaduct a fine view of Ceunant Mawr up to the famous waterfall is obtained. The line turns to the left, and at the first station a few yards further the summit may be seen about 4 miles to the southward. Under a quarter of a mile from waterfall station a bridge of 50 ft. span is reached. On the right is another pretty waterfall—Ceunant Bach. The line onward for about 2 miles may be seen gradually ascending the long slope of Llechog, the ridge of which on the left above the track hides the pass of Llanberis. Soon the train has risen sufficiently on the slope of Llechog to command a view of the peaks of the two Elidirs, on the other side of Llanberis Pass.

At every yard higher the view extends lower down the front of Elidir, until the upper galleries of the famous Llanberis slate quarries are in sight. Three miles from Llanberis, and at the highest part of Llechog, the first view of the well-known Llanberis Pass is obtained. Looking down almost perpendicularly from a rocky plateau, the bottom of the valley can be observed with the high road and stream 2,000 ft. below. Right opposite are the mammoth forms of the two Elidirs Y Garn and the two Glyders. The railway again crosses the Llanberis Path, and then turns to the right. A gentle curve to more open ground, a glimpse of the summit, and the line approaches Crib-y-Ddysgl, along the western slopes of which it continues almost direct for the summit, parallel with the Llanberis mountain path, into which the Capel Curig path enters on the left, while the Snowdon Ranger path comes up from below on the right. On the western side of the summit the terminus is soon reached, and 20 paces on the left of the platform the traveller attains the very peak of the cairn. For the sake of the magnificent spectacle, many visitors spend the night at the hotel on the Snowdon summit in order that they may view the sun rising over the mountains.

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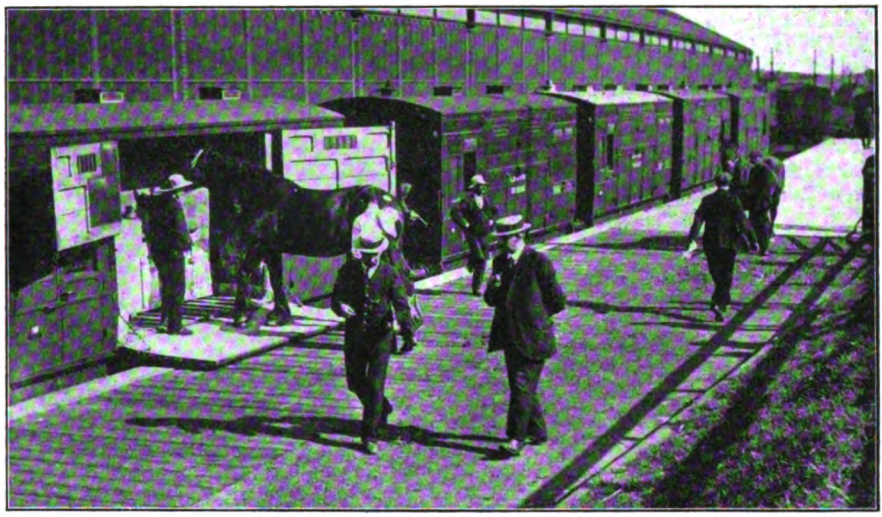
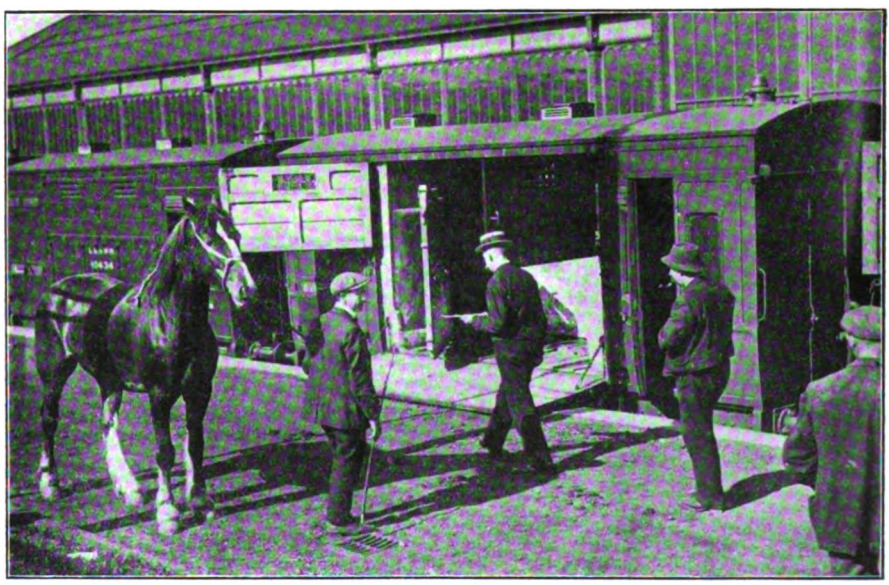
Equine Travellers on the London and North Western Railway.



ENTRAINING.



DETRAINING.

Photos] [*L. & N.W.R.*

Serving by its own lines, steamboats and connections most of the agricultural and horse shows in the United Kingdom, the London and North Western Railway receives from exhibitors valuable consignments of horses. Dublin Horse Show, held annually in August, entails at Holyhead shipping and unshipping of no fewer than 1,200 equine travellers.

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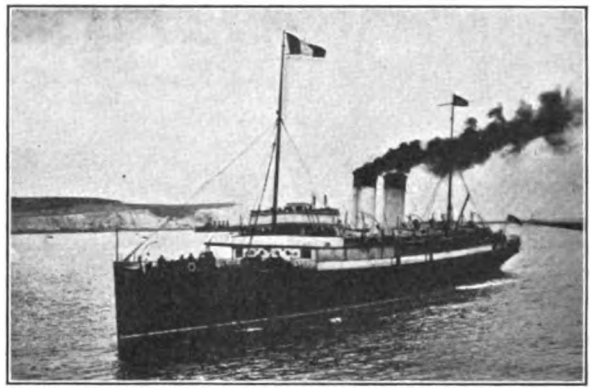
PERTINENT PARAGRAPHS

The New S. E. & Chatham London and Paris Services.

Success has from the outset attended the additional continental services which were introduced on the 1st of July by the South Eastern and Chatham and the Northern of France Railway Companies. Particulars of these new links in the chain of travel between England and France were given in the last issue of the Railway Magazine. The outward journey is made by an express which every day in the week (Sunday excepted) leaves Charing Cross at 4.30 p.m., reaching Dover at 6 p.m. A connecting train starting from Calais at 8.0 is due in Paris at 11.25, and for that portion of the journey a restaurant car is available. This has already been recognised as a particularly convenient service for passengers who prefer to pass the night in Paris, and join the day express trains the following morning for Bale or Lucerne. When returning to London, travellers are allowed (at a supplementary charge of 11s. 3d.) to enter the sleeping cars in the Gare du Nord at 11 p.m., so that they begin the night's rest before the train starts at 12.30 a.m. It is stopped only once *en route* (for engine purposes), and running all the way at



SOUTH EASTERN AND CHATHAM RAILWAY'S TURBINE *Engadine* ENTERING DOVER HARBOUR WITH CONTINENTAL PRESS AND RAILWAY REPRESENATIVES ABOARD.

SOUTH EASTERN AND CHATHAM AND GREAT NORTHERN OF FRANCE RAILWAY REPRESENTATIVES, WITH FRENCH AND ENGLISH NEWSPAPER CORRESPONDENTS, AT IMPERIAL SERVICES EXHIBITION, EARL'S COURT, TUESDAY, JULY 1, 1913.

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a moderate speed, comfortable sleep is assured. Calais is reached at 6.20 a.m.; the Channel crossing is made in daylight by one of the turbine steamers; and a first-class Pullman breakfast car forms part of the train from Dover to Charing Cross, which is reached at 10.15 a.m. This latter service is especially welcome to passengers from Italy, the Riviera, Switzerland, Aix-les-Bains and other places, inasmuch as it enables them to take the day instead of the night expresses to Paris, where they arrive about two hours prior to the departure of the train for Calais, and at once obtain sleeping car accommodation at the supplementary charge mentioned. In connection with these additional services, extra fast trains are now running between Calais and Switzerland, *wagon-lit* and *lit-toilette* cars being available in each direction. To celebrate the new arrangements, the South Eastern and Chatham and Northern of France Companies invited the Paris correspondents of British newspapers and many French journalists to London on the 1st July. Numbering over 100, the party were welcomed on arrival at Charing Cross station by Mr. Francis H. Dent, General Manager, and Mr. J. Avis, Continental Manager of the South Eastern and Chatham. After driving to different places of interest in the Metropolis, the guests lunched in the Quadrant Restaurant at the Imperial Services Exhibition, Earl's Court, where Mr. Dent presided, accompanied by Mr. Davison Dalziel, M.P. (Chairman of the Pullman Car Company), and M. Felix Sartiaux (Assistant Manager of the Northern of France Railway). Simultaneously, Mr. Alfred Sire presided in the Welcome Club at a luncheon given by the Northern of France Company to a party of French naval and military officers, who had travelled from Paris by the new train. At each gathering the *entente cordiale* afforded ground for mutual congratulation, and an enthusiastic demonstration was aroused when the success of the Channel Tunnel project was confidently predicted by Lord Rotherham, who had joined the party entertained in the Welcome Club.

* * *

Interchange Holiday Grounds—England and Germany.

A FEATURE in these days of international courtesy and friendship is the growing tendency for people here to spend holidays in Germany or other continental countries, while visitors from the "Fatherland" every year cross the North Sea to England in increasing number. The Great Central Railway Company have done much to foster this exchange of traffic, and the steamers running between Grimsby and Hamburg carry many tourists in each direction. Officials of the company recently made a tour through Germany, studying local conditions in the endeavour to arrive at a scheme which would promote the interchange of visitors between that country and our own. "The first thing we noticed in Germany," says one of the gentlemen who took part in the tour, "was that the great bulk of the people were much interested in England and in things English, and that all the people we met were friendly disposed towards us and anxious to know us and our country better. That was a valuable spirit for our purpose, so the next thing we proceeded to study was how to make a trip to England simple and convenient, and, having discovered that, how to make it widely known among the German people." As a result a series of trips to England devised on a "flat rate" principle were arranged. Take, for instance, an eight-day tour from Hamburg to England for £6 10s. The German visitor gets a saloon passage from Hamburg to Grimsby and return. From Grimsby he goes by rail to Lincoln, thence to London, without which no tour of England could be considered complete, and his ticket includes his hotel bill in London. From London he goes to Stratford-on-Avon, where a 33 mile motor trip is included in the tour; back to London, where hotel expenses are paid again, thence to Grimsby, and home. Other "flat rate" tours include Liverpool, Blackpool, Chester, and the Isle of Wight, which has long held a particular charm for German visitors. In Germany the publicity campaign is being conducted mainly by booklets and guide books.

On this side the Great Central Company are continuing the policy which has been in operation for several years, and the Grimsby-Hamburg route, at one time considered as only secondary, now ranks as one of the recognised continental services, the steamers being regarded as the best equipped crossing the North Sea. In addition to various guide books, pamphlets and other literature, special mention may be made of "The Continental Courier," which is intended to serve as a daily "guide, philosopher and friend" to the British tourist visiting the two greatest cities of Germany—Hamburg and Berlin. From the moment of arrival in Hamburg, after the trip across the North Sea from Grimsby in one of the steamers of the Great Central Company, until the minute of departure for home, the holiday maker's time is mapped out, so that his visit is made a round of pleasure, mingled with instructive and interesting experiences. A useful dictionary of everyday phrases in German is also included, although English is spoken in almost every hotel, restaurant, cafe and place of amusement in both Hamburg and Berlin. The programmes cover 7 or 9 day trips to either Hamburg or Berlin and a 10-day visit to both cities. A page of useful information deals with customs arrangements, "tips," the rule of the road and other matters about which the tourist is always anxious. The length of the sea journey is not considered as a handicap. It is too long to be called a "crossing" or a "passage," and rises to the dignity of a sea voyage. Visitors are invited to journey *viâ* Grimsby because of the bracing value of 30 hours at sea, and there are still a large number of people to whom the sea trip is the best part of the holiday. It may be added that through trains to and from Grimsby Docks are run in connection with the Great Central steamers, and official interpreters in uniform attend the arrival and departure in Grimsby and Hamburg.

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The Lötschberg Tunnel.

THE Lötschberg Railway, the latest highway driven through the Alps, has been opened for traffic amid great local rejoicing. Described by the RAILWAY MAGAZINE in December, 1912, the line traverses the range of the Bernese Alps, and provides a direct route from England to Italy, Northern and Eastern France, Belgium and the Middle Rhineland. It is unique among mountain railways in the Oberland, in that it is the first of normal gauge to be worked by electric power. The Lötschberg Tunnel is exactly 16,050 yards long, and the construction, begun on October 15, 1906, terminated on March 31, 1911. Geological surveys led the engineers to think that comparatively little difficulty would be encountered in respect of the strata to be pierced; but, instead of being continuous, as had been anticipated, the hard calcareous formation seen at Kandersteg, where the work started, was, on July 24, 1908, found to end abruptly 1,320 yards from the mouth, a dynamite charge revealing in a hollow an old deposit of glacier debris. In a few minutes the tunnel was choked for nearly a mile by at least 250,000 cubic feet of ice, pebbles and sand. This disaster involved the sudden death of 25 Italian workmen, and interrupted further progress for several months. It was then determined to drive another tunnel, which, owing to the detour that was necessary, was about half-a-mile longer than the original, the latter being entirely abandoned. With the aid of Meyer boring machines and Ingersoll-Rand drills, it became possible, however, to excel all previous records in tunnelling, but the cost of the work was far greater than that of any similar undertaking. While the sum of £1,500,000 had been put down in the original estimates, the actual outlay was about £4,000,000. In addition to the unexpectedly large expenditure involved in construction, equipment represented an unusually heavy item. Between Frutigen and Kandersteg—a distance of 7¾ miles—the line rises 1,385 ft., and the conditions of haulage being very exacting, electric locomotives of unexampled power have to be provided. There are at present five of the geared Oerlikon type, 2,000 h.p., exerting a drawbar pull of 22,000 lbs. They are fitted with two single-phase alternating-current motors of 1,000 h.p., working at a pressure of 15,000 volts and 15 cycles. Each locomotive is capable of pulling a 310-ton train through the tunnel, while in the St. Gothard tunnel two steam engines have to be employed for a like task. There is also a German-made locomotive of 1,600 h.p., capable of hauling a load of 250 tons on the maximum gradient of 1 in 37 at 26 miles per hour. Three electric motor coaches are available for local traffic, containing third-class accommodation for 64 passengers. Each coach is equipped with two motors of 225 h.p. and together they haul a total weight of 135 tons. It may be added that the Simplon—the longest of the Alpine tunnels, opened in 1906—is 12¼ miles in length. Its highest point is 2,300 ft. above sea level, and even there the track is 7,000 ft. below the mountain peaks. From end to end the journey is made in 25 minutes. The St. Gothard tunnel, which cost £2,250,000, and was completed in 1882, is 9¼ miles long, its highest point being 3,786 ft. above sea level. Steam locomotives are employed, and express trains run through the tunnel in 18 minutes.

* * *

A Remarkable Railway Model.

IN our last issue reference was made to the splendid model of Immingham Dock which forms part of the Great Central Railway exhibit at the Ghent Exhibition. Made by Messrs. Bassett-Lowke, Ltd., the model is 26 ft. long and 14 ft. wide. Within this space an area of approximately two square miles is represented, the scale being 33 ft. to the inch. The case is divided into 11 sections, the largest being 8 ft. by 6 ft. 6 in. Bases of all the sections are of the finest Honduras mahogany and teak, with heavy cross bracings of pine. There are in the vicinity of Immingham Dock over 170 miles of railway track, and the whole has been faithfully reproduced in the model, all the rails being of metal, complete with switch tongues, points, check-rails and turntables. The gauge of the track in the model is only a little over an eighth of an inch. There is altogether nearly three-quarters of a mile of this miniature track, all properly ballasted; and on the tracks in the many sidings, the inclines, and the main roads are placed 2,500 trucks, covered wagons and brake vans, two complete passenger trains, and 15 locomotives. These last are all miniatures of Great Central engines, six being heavy eight-coupled tanks and the rest tender engines. Among the latter are the *Sir Sam Fay*, *Immingham*, and an "Atlantic" passenger locomotive. Engines and tenders are about two inches long. The dock itself is approximately in the centre of the model, while a portion of the River Humber occupies one edge. Lying alongside the coaling hoists, quays and jetties are 19 passenger and cargo steamers, each complete with its top hamper. The buildings, of which there are 42, are perfect reproductions of the originals. Cornices and stringcourses are rendered in relief, and not merely painted. Excluding the chimney stack of the power-house, the highest building is the granary, which measures about five inches in height. Signal cabins, one inch high, have glazed window frames and real flights of steps complete with handrails. The country surrounding the docks has been treated so as to form a pleasing setting for the purely engineering features of the model. Coal hoists, cranes, and water towers and the signals are splendid examples of fine metal work. This gigantic model was executed by Messrs. Bassett-Lowke, Ltd., of Northampton, within four months from the time the first plans were made until its erection at the foot of the grand staircase in the Ghent Exhibition. During his recent visit, the King of the Belgians expressed great admiration of the model, and spent some time examining the details.

* * *

The "Devon and Cornwall Special."

THIS new express train, for third-class passengers only, is the latest feature introduced by the Great Western Company, and we have not the smallest doubt as to its abundant success. A diagram of the train, here reproduced, shows that it is made up of eight long corridor vehicles, vestibuled throughout. Two coaches run to Torquay and Paignton, two to Newquay, and four to Falmouth, one of the last-mentioned being devoted exclusively

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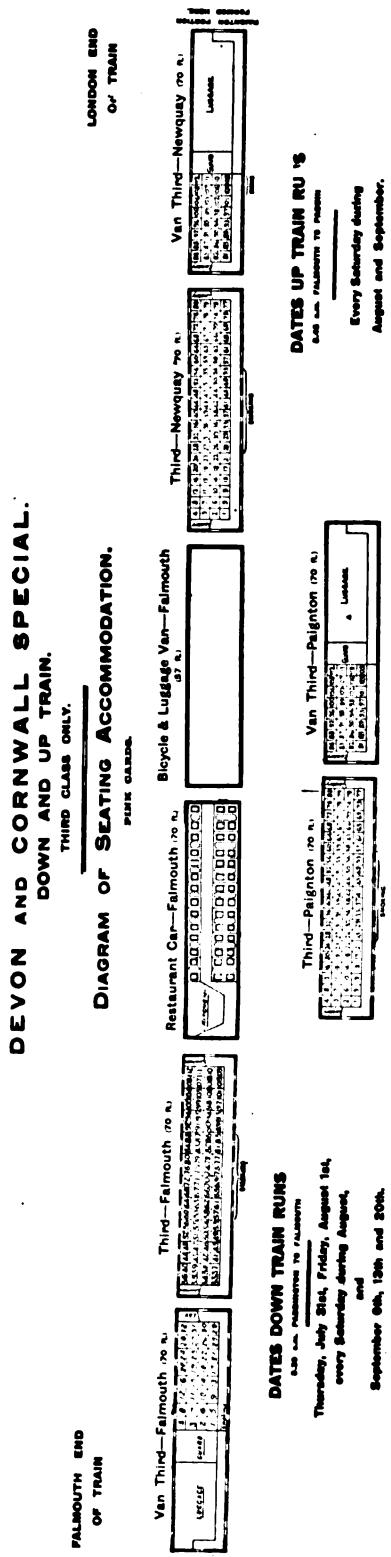
DEVON AND CORNWALL SPECIAL.
DOWN AND UP TRAIN.
THIRD CLASS ONLY.
DIAGRAM OF SEATING ACCOMMODATION.
PARK GARDS.
FALMOUTH END OF TRAIN
LONDON END OF TRAIN
Van Third—Falmouth (70 ft.)
Third—Falmouth (70 ft.)
Restaurant Car—Falmouth (70 ft.)
Bicycle & Luggage Van—Falmouth (57 ft.)
Third—Paignton (70 ft.)
Van Third—Paignton (70 ft.)
Third—Newquay (70 ft.)
Van Third—Newquay (70 ft.)
DATES DOWN TRAIN RUNS
Thursday, July 31st, Friday, August 1st, every Saturday during August, and September 6th, 13th and 20th.
DATES UP TRAIN RUNS
Every Saturday during August and September.

to luggage and bicycles, special provision being available for the latter in each direction. The next vehicle of the Falmouth section is a restaurant car, in which both luncheon and tea are served from the kitchen. Smoking compartments are found in each passenger coach, and in addition to the special bicycle and luggage van in the centre, space for baggage is reserved in the respective sections, three guards accompanying the train. It is announced, in the first instance, that this "Devon and Cornwall Special" will run from London to the stations named on Thursday, July 31 and Friday, August 1, as also on every Saturday in August and on Saturdays September 6, 13 and 20, leaving Paddington at 9.30 a.m. On the return journey the train will, every Saturday in August and September, leave Falmouth at 8.45 a.m. Passengers are advised to register their seats in advance, a fee of one shilling being charged for the reservation of each seat.

* * *

German Railway Progress.

It is officially stated that the total receipts of the German railways in 1912 amounted to over 3,100,000,000 marks—an increase over 1911 of about 200,000,000 marks, or 6.8 per cent. Passenger receipts advanced by 50,000,000 marks (5·5 per cent.), and goods traffic by 150,000,000 marks (7·5 per cent.). "This increase," says Sir Francis Oppenheimer, Commercial Attaché to the British Embassy at Berlin, "was reached although in several of the industrial centres the railway system broke down under the demands made upon it. In the Ruhr district the collapse amounted to a national calamity. The local railway traffic board, consisting of men in business, had estimated the probable increase in the local traffic for 1912 at 7 per cent. It actually amounted to 16·6 per cent. in a year in which natural conditions favoured inland navigation to an exceptional degree. During the month of November the daily shortage of trucks in this industrial centre amounted to over 7,000, and for the whole month of November it amounted to 230,000 trucks. Similar difficulties, but on a reduced scale, were experienced in Silesia, in the Luxemburg district, the Bavarian districts near the Rhine (Pfalz), the Saxon provinces, etc., though the railway administration has become very particular in the time granted to consignees for unloading that even the keenest cannot easily escape the fines levied for delay. On the other hand, the Railway Administration has granted considerable rebates in the freight charges in all those cases in which the full loading capacity of the trucks (15 and 20 tons respectively) is exploited." The quantities of coal and sugar beet carried on the railways showed enormous increases. To remedy the shortcomings which the traffic of 1912 revealed, the Prussian State Railways have issued a railway loan of £27,000,000, it having been declared that the shortage of trucks was only an incident of the congestion, which was pre-eminently due to an insufficiency of the lines and the goods stations serving the various industrial centres. Of this total, £9,500,000 is to be spent upon new rolling stock for the existing lines; £5,500,000 in multiplying existing lines; £5,500,000 for stations, etc.

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An American Railway Museum.

DESPITE various attempts to found a railway museum in this country, the nearest approach in that direction we have is the collection at South Kensington, a good one no doubt in its way, but not altogether what might be expected in a museum of transportation. Our neighbours across the Atlantic are not much better off, but in several places important railway relics are there preserved. Mr. C. H. Benjamin, Dean of Purdue University, has published particulars of the collection of railroad curiosities which are preserved in that celebrated centre of scientific investigation. Among the old engines there to be seen is a 4–6–0 "camelback" of Winans type, built in 1868 for the Baltimore and Ohio Railroad. The cab is on top of the boiler, behind the large smoke stack, so that the fireman has the ordinary footplate all to himself. Near is a Chicago and North Western 4–4–0 engine, representing a standard in use 15 or 20 years ago, although it was built in 1873. Just beyond is a wooden model of a peculiar engine, the *Tornado*, presented to the University in 1902 by the Seaboard Air-Line Railroad. The vertical fire-box with spherical top, the inclined cylinders coupled directly to the single pair of drivers, and the slenderness of the construction are its prominent features. There is no cab, the brakes were set by a lever, and the old-fashioned hook-motion was used. The next engine is unique, and probably unlike any other locomotive which was ever built, the *Reuben Wells*.

With 10 coupled drivers, long wheelbase, and super-imposed tanks, it is an engine that would attract attention without the conical stack which stamps it as a wood-burner. Added to the collection through the generosity of the Pennsylvania lines, it was built in 1868 especially for use on the Madison incline, which runs from the Ohio river at Madison, Indiana, to the top of the hill. This incline, a mile and a quarter long, rises almost uniformly at 320 ft. to the mile. It was formerly operated as a rack railway, and the *Reuben Wells* was the first engine to carry a train from the bottom to the top without the use of rack and pinion. The shell and tubes of the boiler are slightly inclined, and the engine is equipped with a sled or track-brake. A carriage of stage coach type, used about 1840 on the Boston and Providence Railroad, is another relic in the same department. The *Daniel Nason*, built in 1858, was part of the equipment of the Boston and Providence Railroad, and was deposited in the museum by the New York, New Haven and Hartford Railroad. Its conical wood-burning stack, the curious arrangement of the steam-dome, sand-box, and bell, and all the details of the running-gear at once stamp this locomotive as antique. When first placed in the museum, the paint and decorations were fairly well preserved, but in 1909 it was found necessary to clean and paint both engine and tender in order to preserve them from deterioration. Patterns were made of the original decoration and lettering, and the colours and outlines reproduced as carefully as possible. This engine is inside connected, a type of construction inherited from its English ancestors, but soon abandoned for the outside connections which are now universal in American locomotives.

The last of the locomotive collection is the *Marmora*, one of the so-called Eddy type of engines presented to the University by the New York, New Haven and Hartford road in 1908. While this engine is not so old as some of the others, having been built in 1872, it is interesting as probably the only survivor of that particular kind of locomotive. The most prominent peculiarity is the so-called cannon domes for the safety-valve and for the whistle. Another feature differentiating it from others is the peculiar arrangement of the fire-box, which was made fast to the engine-frames, and expansion and contraction provided for in the saddle. Historic locomotives are not, however, the only things of note in the museum. There are several models, conspicuous among which is a full-sized one of the Richmond compound cylinders and front-end. This is so sectioned as to show all the details of the mechanism. The American Locomotive Company has also given a full-sized model of one of their locomotive cylinders with piston-valves. In the same collection the peculiar track of the earlier days of railroading is represented. Longitudinal sills of stone or wood with rails of strap-iron bear little resemblance to modern track construction. These rails, when jarred loose at the ends by traffic, had a disagreeable habit of curling up and piercing the floor of the car. They were colloquially known as the "snake heads," and were more dreaded than the average "rattler." The oldest example of this sort, and probably one of the oldest in America, was used on the Baltimore and Ohio Railroad from 1829 to 1832. Numerous other ancient and peculiar track sections are included in the exhibits, among them a stone pedestal and iron shoe from the Midland Railway in England. A row of locomotive stacks of different shapes and heights remind one of the extensive experiments carried on at the University to determine the efficiency of various arrangements of stacks and front-ends.

* * *

Poetical Railway Correspondence.

A CORRESPONDENT of the *South African Railway Magazine* suggests that the introduction of poetry into railway correspondence would assist to render "the trivial round, the common task" a labour of love and work would be no longer a toil. He is compiling a handbook—"intended to completely revolutionise the methods of railway correspondence"—and although, as he states, some of his colleagues have been so ill-advised as to treat the matter with most reprehensible levity, he is not disheartened, and in the pages of our South African contemporary he presents a few leaves from "The Railwayman's Handbook of Correspondence," based upon railway conditions in the Union. Here are several examples:—

EXAMPLE—GOODS U./E.

"Here unentered, no address,
A box of eggs all in a mess;
Wire disposal, if you please.
Till you do I'm ill at ease.

REPLY.

"Eggs were sent by Mr. Lee,
Mr. Jones is consignee;
Charges, one-and-six to pay;
I am entering up to-day.

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EXAMPLE—GOODS NOT TO HAND.

"Refer your invoice forty-three,
J. H. Smith—one case of tea;
Goods are missing at this place.
Reply at once and forward trace.

REPLY.

"Your wire of date in this connection,
I've sent the goods for your inspection.
Regret the case was left from truck,
Was found to-day—a bit of luck.
Please send my invoice, fifty-three,
Of April fourth, one-nine-one-three.

EXAMPLE—LIVESTOCK CLAIM.

"We sent to Aberfeldy about three years ago,
A consignment of two horses for the Agricultural Show.
We have just received a letter from the consignee, J. Brown,
In which he states the horses never reached the blooming town.
Please investigate the matter, we are rather in a fix;
If you have lost the horses, we shall claim for one-and-six.

REPLY.

"In reply to your favour, we much regret to state
The animals in question met a most untimely fate;
They died at Slabbert's station—went off in a decline,
The burial expenses amount to one-and-nine.
So we've come to the conclusion—you may think it somewhat tricky—
Instead of claiming one-and-six, you owe us just a tickey."

* * *

American Pioneers of Locomotive Development.

A WRITER in *Railway and Locomotive Engineering* has very naturally challenged the reckless statement that the steam engine was invented and perfected by James Watt, and that the locomotive came in like condition from the hands of George Stephenson. Of course, no well-informed person would make such extravagant claims. James Watt and George Stephenson were, it cannot be denied, responsible for valuable experiments and developments in stationary and locomotive engineering respectively, and are deserving of all honour as pioneers whose work helped to pave the way for their successes. In later years American engineers have developed the locomotive on special lines, and the writer in our United States contemporary succinctly reviews some of their splendid additions to the locomotive of to-day. He says: "Take, for example, the standard characteristic four-coupled bogie locomotive. The high-pressure, high-speed engine itself, so simple and efficient, is the invention of Oliver Evans. The multi-tubular boiler so essential to rapid steam making, and without which no train could have been kept running more than 10 miles an hour, was invented by Nathan Read, an American. It is carried in compact form by four-coupled driving wheels and a four-wheel truck—a combination patented in 1836 by Henry R. Campbell, of Philadelphia, the truck having been previously invented by John B. Jervis, of Rome, New York. The driving wheels, of cast iron made hollow, are the invention of Thomas Rogers, of Paterson, New Jersey, who was also among the first to use weights secured in the wheels to counterbalance the momentum of the reciprocating parts. Allen paper wheels—a thoroughly Yankee notion, the invention of Richard Allen, an American—carry the engine truck, and the tender is sustained by cast iron wheels with chilled tread, first invented by Ross Winans, of Baltimore. The single bar frame, holding cylinders placed horizontally and bolted together in the centre is another remarkably strong and compact combination, designed in part by Winans, but put in its present shape by William Mason, of Taunton, Mass. All the pipes and joint connections are secured against leakage by the ground joint, invented by M. W. Baldwin, of Philadelphia. Expansion braces, first brought out by Rogers, give the fire-box a secure hold on the frame, yet permit the boiler to lengthen or shorten as change of temperature requires.

"The weight of the engine is distributed evenly to the axle-boxes by means of equalizing levers, invented in 1837 by Joseph Harrison, of Philadelphia. Two fixed eccentrics, invented by William James, of New York, give movement to an Allen slide valve, balanced by a Richardson device, the invention of George Richardson, who also patented the pop safety valve, the most perfect device ever tried for relieving boiler pressure. The slide valves are operated by Baker-Pilliod motion, and are oiled by a Detroit lubricator. Spark throwing is restrained by an extended smoke-box combination invented by E. M. Reed, once General Manager of the New York, New Haven and Hartford Railroad. Combustion is admirably promoted and smoke-making prevented by a perfected design of fire-box, which is constructed of mild steel, first made successful for that purpose by the Baldwin Locomotive Works. The engineer and fireman sit comfortably in a convenient cab, first applied by David Matthews, but since improved by every builder in the country. As the locomotive thunders along through the blackness of midnight over giddy chasms spanned by traceries of steel, on the dangerous grades of mountain scenery or through the sameness of Western plains, the engineer sits calm and steadfast, secure in the knowledge that engine and train are perfectly under his command. This entire confidence is begotten of the knowledge that a turn of the hand would grasp every wheel in the train between vice-like brake-shoes, applied by that greatest life-saver of modern times the Westinghouse automatic air brake, one of the most valuable parts that the American inventor has added to railroad machinery."

* * *

Irish Railway Rates.

THE following important statement, made by Mr. J. Bagwell, General Manager of the Great Northern Railway (Ireland), is sufficient to justify the action of the Directors of the Irish Railways in following the example of the English Boards and increasing rates by 4 per cent. "The present maximum rates were fixed by the Board of Trade, on the basis of the railway business of 1892. They came into effect on January 1, 1893. In the figures I am giving

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you I am speaking of this railway, and I am comparing 1892 with 1912. The gross receipts have increased 48 per cent., the expenditure 81 per cent., the net receipts 14 per cent. I am not giving you the fractions. The ratio of expenditure to receipts was 50 per cent. in 1892, and 61½ per cent. in 1912. On the English railways in these 21 years the total receipts have increased 56 per cent.; on the Scottish railways 49 per cent.; and on the Irish railways 42 per cent. The expenditure has increased as follows:—English railways 74 per cent.; Scottish 59 per cent.; and Irish 62 per cent.; and the net receipts are:—English railways 33 per cent. increase; Scottish 37 per cent. increase; and Irish, 17 per cent. increase. These figures show that the position of the Irish railways has not improved in the same ratio as the Scottish and English railways in those 21 years from 1892 to 1912. Comparing 1892 with 1913, rails have increased 61 per cent., sleepers 87 per cent., chairs 41 per cent., fish plates 55 per cent., coal 15 per cent., rates and taxes 132 per cent. As soon as it can be arranged it is also proposed to increase the through rates to England and Scotland." Unfortunately, the Railway and Canal Traffic Act of last session was not, as the Government wished, extended to Ireland, and the result is that any of the Irish companies may be called upon by any trader to substantiate such increase before the Railway and Canal Commission.

* * *

American Railway Nicknames.

MR. E. J. CLARKE, an old and valued correspondent of the RAILWAY MAGAZINE, writing from Alaska, where he is now engaged in railway work, says:—"In mentioning the subject of railway nicknames in the 'Pertinent Paragraphs,' you quote from an American contemporary that the New York, Newhaven and Hartford Railway is known as the 'Nickel Plate.' This is an aspersion that the 'Newhaven' really does not deserve, the only original Nickel Plate road being the New York, Chicago and St. Louis Railroad. *A propos* of the same subject, I think America can also be called the home of train nomenclature, humorous, whimsical and fantastic. In the far eastern States the nomenclature is fairly staid, as becomes strict New England ancestry. In fact, I think that 'The Detroiter' is the nearest approach to slang on the New York Central lines. But what shall be said of the Monon (Chicago, Indianapolis and Louisville Railroad), which exhorts people to travel between Chicago and the French Lick Hot Springs by 'The Red Devil,' and appends an illuminated portrait of his satanic majesty to the last coach! Perhaps the other extreme is reached by the Santa Fe, which calls its night trains between San Francisco and Los Angeles the 'Saint' and 'Angel' respectively. As an example of terse designation the Chicago and Alton provides the 'Hummer' from Chicago to Kansas City, and the Houston and Texas Central follows with the 'Hustler' from Galveston to Dallas, Texas. Nautical terms receive passing notice. The C. H. and D. provides the 'Lima Skipper' between Cincinnati and Lima, Ohio, whilst the Dominion Atlantic, a Canadian concern, is responsible for perpetrating two 'Flying Bluenoses' between Boston and Yarmouth, N.S. The Central of New Jersey runs the 'Mermaid' from Scranton to Point Pleasant, and advises that it will convey a 'Broiler Parlor Car.' Just what is the exact meaning of 'broiler' in this connection I am not sure. Birds come in for frequent mention. The Chicago and Alton has the 'Nightingale' on the night run from Chicago to Kansas City, and the 'Early Bird' from Kansas City to St. Louis; the Southern Pacific runs the 'Lark' between San Francisco and Los Angeles on the Coast line, and the 'Owl' *vid* the Valley line; the 'Owl' is quite a favourite and old-established name for night trains, and the remark of the irrepressible 'commercial' after a prolonged screech of the whistle for some station 'Why does the Owl 'owl?' has long been relegated to oblivion. Of ordinary everyday names there are legion, but I think perhaps the two most harmonious for up and down trains are the 'Olympian' and the 'Columbian,' the transcontinental trains of the Milwaukee, although by the facetious they are rather too easily corrupted into Harlequin and Columbine."

* * *

The Northern Junction Railway Bill.

A SELECT Committee of the House of Commons has rejected the Bill which proposed the continuation of the Northern Junction Railway, beginning at Brentford and terminating at Wood Green. The line would have connected seven different railway systems, but it was opposed by the London and North Western and Midland Companies, as also by those responsible for the creation of the Hampstead Garden Suburb, which is considered to afford the finest example of town-planning yet seen in England. Little attempt was made to meet the strong objections raised in respect of the last-mentioned interest, and this attitude led the Committee to decide against the scheme. Scenes of unexampled enthusiasm were witnessed the same night when the result reached Hampstead, as it was recognised that, if sanctioned, the projected railway would have spoiled the Garden Suburb A special correspondent of the *Westminster Gazette* stated that "the news of the killing of the Bill was conveyed at once to every 'Way' and 'Close,' at first by hand-delivered notices, and when these ran short, by the time-honoured fashion of bell and 'Crier' 'Death of the Railway Bill' resounded on the allotments, and disturbed the attention of green-fly hunters in pergolas; while the further announcement of a meeting of jubilation in the Club House sealed the fate of thirsty gardens for that day. The residents thus summoned at a few minutes' notice 'downed' gardening-tools and supper and flocked to the meeting-hall to continue rejoicings in co-operative fashion. Never has there been such a gathering—not even on the opening-day of this working-people's meeting-house The hall was quickly crowded, and late comers gathered in throngs at the entrance and round the open windows"

* * *

Workmen's Tickets.

THE existing arrangements regulating the issue of workmen's tickets are based upon the Cheap Trains Act of 1883. This Act required that provision should be made for "proper third-class accommodation and workmen's trains at such fares and at such times between 6 o'clock in the evening and 8 o'clock in the morning as

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appear to the Board of Trade to be reasonable." Workmen's tickets were, however, supplied under statutory obligations long prior to that date. The Metropolitan Company issued workmen's tickets from the time their City Extension was opened in 1865, and even before their line reached the City they had some kind of workmen's tickets. The first record of the issue of workmen's tickets on the Great Eastern Railway is July, 1871, from Stratford Bridge and Old Ford to Bishopsgate by two trains for which 1s. weekly tickets were sold. These were not under statutory obligation. The first workmen's tickets issued by that company under such conditions were those available under the 1864 Act (dealing with the Edmonton and Walthamstow lines) from Stoke Newington to Bishopsgate. As showing the extensive character of the present workmen's traffic on the Great Eastern Railway, we may mention that a statement prepared not long ago contained the following remarkable statistics:—

	No of trains each way.	Distance.
Required by Act of Parliament	5	22¼
Actually run (including cheap return)	217	1,539

* * *

The First Locomotive in Canada.

SOME time since a description was published in the RAILWAY MAGAZINE of the first locomotive used on the Canadian Pacific Railway, but to find the earliest locomotives seen in the Dominion we must go back to the days of small isolated lines. An American contemporary states that the first locomotive to run in Canada was the *Dorchester*, built in Great Britain in 1836, here given her road trials and then taken to pieces for shipment to Canada and reconstruction. This engine was the property of the St. Lawrence and Champlain Railroad Company, and ran for several years in the Province of Quebec between the towns of Laprairie and St. Johns. The locomotive *Canada*, another of these typical "old-timers," was also owned by the St. Lawrence and Champlain Railroad Company, and, together with engines Nos. 38 and 40, was run between St. Lambert and St. Johns. These locomotives were most familiarly known as the "Greenback" type. The *Souhegan*, considered to be a fine little engine of the same period, was built in Scotland about 1846. She and her sister engine, the *Jason C. Pierce*, also imported from Scotland about that time, were the first to run over the tracks of the Montreal and Lachine Railroad. These two locomotives, afterwards sold to the Lamorie and Industrie Railroad Company, ran for several years between those villages, the road being between eight and a half to nine miles in length. It was unique in construction, the tops of the wooden rails being protected by strips of iron.

* * *

"The Switzerland of South America."

A COMPANY with a capital of no less than £22,000,000 is projected for the purpose of extensive railway development in Minas Geraes, which has been described as the "Switzerland of South America." This State covers an area of nearly 575,000 square kilometres, and its population already exceeds 4,500,000. By far the larger majority of the people follow agricultural pursuits, and in a single year the exports from the farms have reached a total of more than six millions sterling. The potential wealth of the country is declared to be enormous, and it is said to possess iron and minerals in sufficient quantity to supply the whole of the world's markets! About 1,000,000 men are now employed in the mines, but the present supply of labour is described as "poor and expensive." The chief hindrance to further trade expansion on a gigantic scale is the absence of adequate means of transportation. Existing single lines cannot cope with the work, and the ambitious undertaking indicated is, therefore, considered to be essential before any substantial result is possible. The capital mentioned would be employed not merely in making new railways which would pass through the cultivated areas and penetrate the mountainous districts of the iron ore fields, but also in the purchase of the mineral deposits, and in providing ample shipping facilities. Formerly it was suggested that the port of Victoria should be equipped for the latter purpose, but it is now thought that Santa Cruz, 20 miles to the north, would be a still cheaper and more convenient ocean outlet.

* * *

Uniform Railway Gauge.

THE engineers-in-chief of all the States, except Tasmania, met in Melbourne recently for the purpose of discussing the question of standardising the railway gauge throughout Australia. The conference decided in favour of the New South Wales gauge, *i.e.*, 4 ft. 8½ in. It was pointed out, the "Pastoral Review" states, that if the 5 ft. 3 in. gauge in use in Victoria and a part of South Australia were adopted the cost of conversion, including alterations to rolling stock, would be £51,659,800, while the cost of converting to the 4 ft. 8½ in. gauge in use in New South Wales would be £37,164,000. This represents a difference in favour of the New South Wales gauge of £14,495,000. The cost in each of the States of converting to the 4 ft. 8½ in. gauge is made up as follows:—New South Wales, for the Deniliquin line only, £120,000; Victoria, £6,117,000; Queensland, £12,578,000; South Australia, £6,228,000; West Australia, £10,310,000; Commonwealth, £1,281,000. If the New South Wales lines only were converted to the 5 ft. 3 in. gauge the cost would be £19,319,000, while the conversion of the Victorian and South Australian 5 ft. 3 in. tracks to 4 ft. 8½ in. would cost £7,295,000. As an alternative to standardising all the railways of Australia the conference recommended the construction of a 4 ft. 8½ in. gauge from Fremantle to Brisbane, the cost of which is estimated at £12,142,000.

* * *

A Remarkable Railway Motor Omnibus.

THE London and South Western Railway Company have sold to the Aldershot and District Traction Company, Limited, the two motor omnibuses which have during the last five years been running between Haslemere station and

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Farnham. One of these cars—built by Messrs. John I. Thornycroft & Co., Limited—has, we are informed, in that period been driven no less than 40,000 miles by Mr. Theo. Homan, the conductor being Mr. E. L. Downing, both of whom are seen with the vehicle in the accompanying photograph. The traffic by road between the two towns has greatly increased, and we understand that the Aldershot and District Traction Company intend not only to provide a more frequent service, but to run on Sundays as well as on weekdays.

* * *

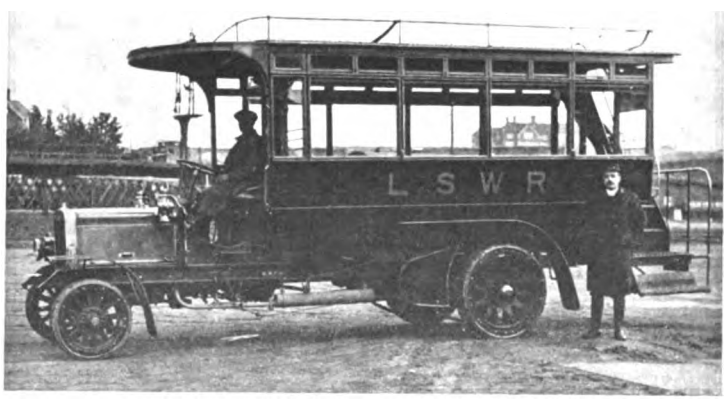
The Freshwater, Yarmouth and Newport Railway.

AFTER being worked since July, 1889, by the Isle of Wight Central Company, this line, 12 miles long, is now being conducted as a separate property. Hitherto trains have used the Isle of Wight Central station at Newport, though a reversal has been necessary in order to reach the Freshwater line. A separate station has now been erected, so that passengers have to walk a few yards from one station to the other. A service of 8 trains (9 on Saturdays) is provided each way daily, and 5 on Sundays. For working traffic one of the Brighton "Terrier" tank engines belonging to the London and South Western Company (No. 734) has been obtained, the other engine being a 0–6–0 Manning Wardle tank. An unusual feature is the announcement that a "petrol motor car, to convey 12 passengers, may be hired to run at any time when the line is clear to and from any point on the Freshwater, Yarmouth and Newport Railway, on payment of a minimum of four 1st class fares or eight 3rd class fares." Intending hirers are advised that, to prevent disappointment, application should be made prior to the day on which the car is required. Mr. W. H. Hunstone is manager, with offices at Newport.

* * *

The Royal Tour in Lancashire.

THE King and Queen were immensely pleased with their recent tour in the County Palatine, as the letters addressed to Lord Derby and the Lord Mayor of Manchester clearly testify. Indeed, it would hardly be an exaggeration to say that no royal visit to the provinces ever left a more profound feeling of satisfaction and thankfulness, nor demonstrated so strongly the feeling of loyalty and respect for the throne which exists in all the great industrial centres of the country. For ourselves, it is only necessary to add that the railway arrangements were worthy of such a memorable occasion. The royal train provided by the London and North Western Company was used not merely between the Metropolis and Lancashire, but also for the journeys made by rail between different towns. Whenever the territory of the Lancashire and Yorkshire Railway was entered, the officials of that company were responsible for all the arrangements, and an admirable spirit of co-operation prevailed throughout on the part of all concerned.



A MOTOR BUS WHICH HAS TRAVELLED 40,000 MILES IN FIVE YEARS.

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CHEAP excursions are announced by the Paris, Lyons and Mediterranean Railway to Provence, the Riviera and Corsica, as well as to Savoy, Dauphiny and Auvergne, starting on the 2nd and 30th of the present month (August). Including the day of issue, Sundays and holidays, the tickets—second and third class only—are valid for 25 days, and holders may travel *viâ* Calais or Boulogne, as also by the Newhaven-Dieppe route. The pleasure and novelty of these tours are enhanced by the privilege given for a break of journey on the return *viâ* the South Eastern and Chatham at Dover or Folkestone, Calais or Boulogne, Amiens and Paris: and *viâ* London, Brighton and South Coast Railway, at Brighton, Newhaven, Dieppe, Rouen, and Paris. Hand luggage will be conveyed free throughout; heavier baggage may be registered through from London, the respective charges being 6d. per passenger for 56 lbs. by the South Eastern and Chatham, and 1s. for 66 lbs. by the London, Brighton and South Coast. The London offices of the Paris, Lyons and Mediterranean Railway are at 179, Piccadilly. To prevent disappointment, it may be stated that two days' notice is required in respect of tickets taken to Ajaccio (Corsica), and a deposit of 8s. is charged; but this amount is refunded at the end of the journey. Reductions are made in the charge to that station for families of at least three persons, and to Cette and Nice for four members when all travel together. We are asked to explain that the fares quoted in our last issue apply particularly to the Newhaven-Dieppe route, those for other routes being in proportion. The publications issued by the Paris-Lyons-Mediterranean Company include "Ideal Holidays," which contains a map of the system, route maps showing various services and circular tours, particulars of various cheap excursions and special facilities, and routes covering districts recommended for holiday visits. The "P.L.M. Guide to the Alps" is another useful compendium, and a general review of facilities. Other pamphlets describe the watering places served by the Paris-Lyons-Mediterranean Railway, the valley of the Rhône and motor-car services through Alpine districts. That entitled "The Route des Alpes" includes a fine scenic map.

MR. EDWARD VICARS, the British Consul at Lyons, reports that the most interesting event in railway construction during 1912 was the opening for traffic in the autumn of the single-track line from Morez to St. Claude (Jura), being the last section of the Andelot-La Cluse line, which runs through the heart of the Jura, and connects Pontarlier with Lyons, Geneva, and the South of France. The Morez-St. Claude section, which is about 15 miles in length, was begun in 1903, and cost the Paris, Lyons and Mediterranean Railway Company about £611,800. Owing to the mountainous nature of the country through which the line passes, no fewer than 18 tunnels and 9 viaducts were required, and the difference in level, amounting to as much as 960 ft., or 1 in 81, necessitated the building of many loops and zig-zags. Other lines opened for traffic during the year were those from Vichy to Roanne *viâ* Cusset (Central Railway Company), and from Châtel-Guyon to Riom (Paris, Lyons and Mediterranean Railway Company). The railway from Moutiers to Bourg-St. Maurice, at the foot of the Little St. Bernard Pass into Italy, is expected to be opened this month (August). An eventual extension of the line to Aosta by means of a tunnel through the Alps is spoken of as one of many schemes for linking France with Italy. The building of the rack-and-pinion railway from Le Fayet to the top of the Aiguille du Goûter (12,600 ft.), which was begun in 1908, makes but slow progress. It was hoped that the line would be carried during the summer of 1912 to the Tête Rousse (10,380 ft.) close to the great Bionnassay glacier, but financial difficulties occurred, and up to the present the line has only been roughly hewn out of the rock to an altitude of 8,860 ft., and traffic is still confined to the Le Fayet-Mont Lachat section (6,925 ft.). The real difficulties of this enterprise begin at the Tête Rousse station, from which point to the terminus (about 3,250 ft. below the summit of Mont Blanc), heavy tunnelling will be required. Meanwhile, the company have been granted a concession for the construction of a branch line connecting the station of Les Houches, on the Le Fayet-Martigny electric railway, with the Col de Voza (5,242 ft.), the first station on the Mont Blanc line, thus enabling tourists to make the round trip to Le Fayet.

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GREAT EASTERN RAILWAY PIER, LOWESTOFT: THE IMPROVED ENTRANCE.

THE locking frame in the East Cabin at Waverley station, Edinburgh (North British Railway)—said to be the largest in the world—was recently removed and an improved system of interlocking installed. The new frame—containing 260 levers—manufactured by the Railway Signal Company, with all necessary interlocking and other materials to finish the work, was got in readiness on the ground, and the operations, which were under the direction of Mr. W. A. Fraser, Engineer-in-Chief of the North British Railway Company, began at midnight on Saturday. The work proceeded continuously, and was so successfully carried out that it was completed and all the points and signals connected up within a period of five days, ordinary working being resumed on the morning of the following Friday. A temporary signal cabin, containing a ground frame and the block telegraph instruments of the section, was provided to control the outgoing starting signals at the entrance to the Calton Tunnel. Train regulators were appointed, and no engine-driver was allowed to make any movement whatever without first receiving the proper signal from one of the train regulators. Men were also in attendance to work the hand points, and all points which became facing to trains conveying passengers had to be wedged in position before authority was given to the drivers to pass over them. The speed of trains was restricted to four miles per hour, and at all times, night and day, the working arrangements were under the control of two traffic inspectors.

* * *

AT Lowestoft the Great Eastern Railway has just completed very extensive and admirable improvements to the South Pier, which, as many RAILWAY MAGAZINE readers are aware, is railway property. The pier has been widened for a considerable length, and on fête nights, now the season is at its height, there is ample room, congestion and difficulty in walking up and down being no longer experienced. The shelters which have been erected opposite the bandstand are admirably designed. They do not block out the sea view—the glass at the back preventing that—while the system of ventilation adopted prevents them getting hot in summer—usually a great drawback to shelters, but here absolutely impossible. At night they are lighted by powerful incandescent gas burners, so that the evening paper or a book may be read while listening to the band. The seating of the shelters and along the open part of the pier has been planned on lines that make for ease and comfort, and altogether the attractiveness of the pier has been much increased. The illustrations on this page show the improved entrance to the pier and the new covered seats on the pier itself. Residents and visitors are expressing considerable appreciation of the improvements effected. On application to the Secretary, Advertising Committee, Lowestoft, enclosing twopence for postage, RAILWAY MAGAZINE readers may obtain an excellent illustrated guide describing the attractions of England's most easterly holiday resort.

* * *

TRAVELLERS who confine their itineraries to restaurant car routes and to places well provided with hotel and refreshment accommodation have no need to take anxious thought as to the wherewithal they shall be fed. The world, however, contains more adventurous spirits, who from choice or necessity leave the beaten track, and explore districts served by branch lines or even territories not provided with railways, and these are they who must perforce "rough it." For the comfort and nourishment of such, modern science has provided Horlick's malted milk lunch tablets, a delicious food preparation, presenting in a highly concentrated form all the nutritive value of pure full cream milk, with the soluble extracts of choice barley and wheat. Dissolved in the mouth from time to time they furnish a nourishing and invigorating diet. The tablets are supplied in glass flasks convenient for carrying in the pocket. For railway travellers, and athletes they are equally useful, while the hard-working railway officer or professional man who keeps a supply in his desk has always an ideal lunch at command. Samples may be obtained from Horlick's Malted Milk Co., Slough, Bucks., England, by mentioning the RAILWAY MAGAZINE.

Photo] [*W. R. Robinson.*

GREAT EASTERN RAILWAY PIER, LOWESTOFT.
The new covered seats are seen on the left.

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THE projected railway from Vera Cruz to Tampico, which had been abandoned, has been finally taken up by the National Railways of Mexico, and will be vigorously pushed. Preliminary work has indeed already been begun from the Tampico end. This line will open up a very rich agricultural district, which is at present hindered in its development by want of economical means of sending its products to market. The Vera Cruz and Isthmus Railway will shortly complete a branch line to the town of San Andres Tuxtla in the State of Vera Cruz, which is the centre of a rich tobacco district. Preliminary work has also been carried out in the construction of the Vera Cruz, Tabasco and Campeche Railway which will run from Santa Lucrecia on the Vera Cruz and Isthmus Railway to Campeche—a distance of 450 miles—and will bring Vera Cruz and Merida, the capital of the State of Yucatan, in touch by rail with Mexico City, the only means of communication between these points hitherto having been by steamer from Vera Cruz. A branch line will also be built to San Juan Bautista, the capital of the State of Tabasco.

* * *

ONE of the most important of the Great Western new lines under construction in South Wales has been brought into use for goods and mineral traffic. The Swansea District Lines extend from near Briton Ferry Road, on the Vale of Neath section, to a junction with the Llanelly line to Llandilo, near Llangennech, connections being also made with the Rhondda and Swansea Bay Railway by means of the Neath loop, with the South Wales main line near Skewen and with the Morriston branch from Swansea. They were promoted largely with the view of forming a base from which other railways could be extended to tap the virgin coal measures of the Clydach, Cwmgorse, and Egel valleys. An alternative and better outlet for the coal output of the Amman Valley is also provided. The busy area between Llanelly and Llansamlet will be avoided by main line traffic. It is anticipated that passenger trains will shortly be placed on the line, stations at Felin Fran, Llangyfelach, and Pont Lliw being nearly completed. The new lines have involved some notable engineering works.

* * *

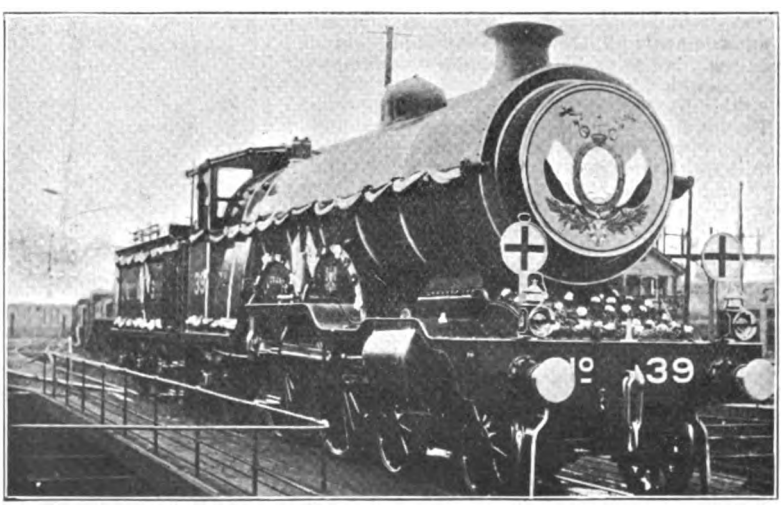
As a cross-country line the Stratford-upon-Avon and Midland Junction Railway provides useful connections with the great systems, and affords particularly convenient routes for Stratford-on-Avon and other places of special interest from many parts of the country. The most direct route for Stratford as regards London is that *vid* the Great Central Railway, with through carriages on the 4.45 and 6.20 p.m. expresses from Marylebone, and the 8 a.m. from Stratford. Other trains have connections almost as fast, and the services from the North *vid* the Great Central Railway are equally good. By way of Blisworth and Northampton the London and North Western Railway makes convenient connections, while at the western end the Midland provides good facilities from Birmingham and towns on the West to North main line. Day, half-day, and other excursions are run regularly and frequently throughout the season from London and many other centres.

* * *

LANCASHIRE and Yorkshire Railway publicity has for several years reached a high artistic and literary level. Many of the productions have been mentioned in these pages. Attention may now be directed to a series of booklets dealing with tours in Belgium by the Hull-Zeebrugge route (Lancashire and Yorkshire and North Eastern Railways). These are neatly produced, with distinctive covers, the text being well written and liberally illustrated. The subjects dealt with are:—(1) Antwerp; (2) Old Flanders and the French Frontier; (3) Heyst, Knocke and Le Zoute; (4) the Ardennes; (5) Brussels, Waterloo and Louvain; (6) Blankenberghe; (7) Ghent; and (8) Ostend. There is also a general brochure upon touring in Belgium. Copies of these publications may be obtained on application to Mr. A. Watson, Superintendent of the Line, Lancashire and Yorkshire Railway, Victoria Station, Manchester.

* * *

ON the occasion of the French President's visit to England the special train provided by the London Brighton and South Coast Company for the journey from Portsmouth to London was drawn by one of the earlier "Atlantics," No. 39, decorated with the French colours and specially named *La France*. The Prince of Wales travelled with him to London.



LONDON BRIGHTON AND SOUTH COAST RAILWAY: 4-4-2 ENGINE NO. 39, DECORATED IN HONOUR OF THE FRENCH PRESIDENT.

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HINTS FOR IRISH HOLIDAYS.

At Victoria station, where the President was received by the King, the reception took place on the platform near Ebury Bridge, where the station had been decorated by the railway company with flags and trophies, in which the Tri-colour was interwoven with the Union Jack.

* * *

A NOTEWORTHY feature of the summer arrangements of the Great Western Company as regards the Cambrian coast is the number of trains which take through carriages for Aberystwyth, Barmouth, and other popular resorts. From Paddington the 9.50 express serves Aberystwyth and Barmouth, and the 11.5 a.m. Pwllheli, Barmouth, and Aberystwyth. From Birmingham the 9.10 a.m. serves Aberystwyth daily, the 12 noon Barmouth and Pwllheli (July 18 to September 13); the 12.10 p.m. has an Aberystwyth carriage daily from July 25 to September 13, and an Aberdovey and Towyn carriage on Fridays and Saturdays. The 8.13 a.m., 1.35 p.m. and 3.35 p.m. trains from Birkenhead and the 12.5 p.m. from Manchester (Exchange) have Barmouth vehicles, *via* Ruabon and Dolgelly.

* * *

Two of the new London and North Western Railway "standardised" posters were illustrated in our last number. A third is reproduced on page 135, and other good posters of a general character are to be seen at stations and on public hoardings. One is issued in the interests of Blackpool—"The Wonderland by the Waves." This picture includes a characteristic view of one of the piers, the background showing the big wheel, the tower, and other prominent buildings. Altogether different in style, the poster devoted to "Leafy Lytham," depicts as the main view the lawns above the beach, with the pier and promenade beyond. Inset is a smaller view of the foreshore, with the windmill and buildings on the green above. A scenic map of the Holyhead-Greenore route provides subject matter for another poster issued from Euston.

* * *

A SUPPER car is now attached to the Havre boat "special," which every week-day leaves Waterloo at 9.45 p.m. for Southampton, and on the return journey the express from Southampton to London in connection with the steamer from Havre includes a breakfast car train, and reaches Waterloo at 9 a.m. By placing these cars on the boat expresses between Waterloo and Southampton, and accelerating the return service from Paris, it is now possible for the business man or pleasure seeker to spend a clear day on the Continent without loss of rest or breaking into another business day going to and fro. So that although *viâ* Southampton and Havre is the longer route to the Continent, it is popular by reason of the exceptional facilities afforded of travel and rest during the night.

* * *

THE Corringham Light Railway was visited by the members of the Railway Club on Saturday, 21st June. After a pleasant walk from Stanford-

A COLLEEN'S INVITATION TO ERIN'S ISLE.

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le-Hope the party arrived at Corringham station about 4 p.m., and were conveyed to Kynochtown by a special train provided by the owners of the railway—Messrs. Kynoch, Ltd. At Kynochtown the members inspected the running shed and rolling stock of the railway, returning by the 5.10 p.m. ordinary train to Corringham, the journey of a little over three miles being completed in 9 minutes, including stops to open and shut level crossing gates at two points where the road from Kynochtown to Corringham crosses the railway. After tea at the neighbouring village of Fobbing, the party returned to town *viâ* Stanford-le-Hope and Tilbury.

* * *

SEVERAL new posters have been issued by the Great Eastern Company. One, by Mr. J. Hassall, reproduced on page 143, depicts the typical fisherman accompanied by two seaside lassies who have obeyed the injunction to "come to the East Coast." In another a lady is seen in bathing costume splashing in the spray, her opinion being decidedly in favour of the "delightful bathing" to be had on the East Coast. The contrast between gloom and sunshine is revealed when a young man in full summer attire steps boldly from the gloomy half of the picture—a dark view of London—into the sunshine of a characteristic East Coast seaside resort. "A Step in the Bright Direction—to the Sunny East Coast" is the appropriate legend.

* * *

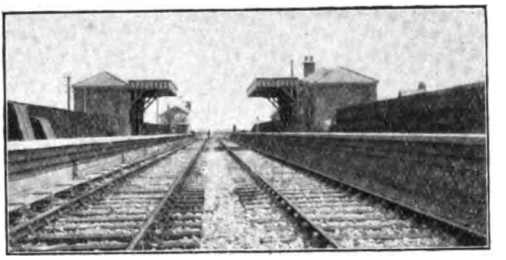
As railways engineers are aware, the fluctuations in the prices of motor tyres do not affect the quality of standard makes any more than variations in the money market influence the quantity or quality of gold in the sovereign mintage. In the same way the reductions in the prices of Avon tyres at this time do not affect the high quality for which the make has always been famous. The Avon India Rubber Co., Ltd., of Melksham, Wilts., supply a large selection of tyres for all kinds of vehicles, ranging from light motor and horsed vans and cars to heavy motor lorries and wagons.

* * *

MR. ROBINSON'S large 4–6–0 engines for the Great Central Railway, "Sir Sam Fay" class, are being named after cities on the system, No. 424 being *City of Lincoln*, No. 425, *City of Manchester*, No. 426, *City of Chester*, No. 427, *City of London*. Some of the engines are now painted green, instead of black as has been usual for six-coupled engines. Superheaters are being fitted to many of the older engines as they come into the shops for new boilers or other repairs. Several of Mr. Pollitt's 4–4–0 engines have been thus treated, as well as Mr. Robinson's own 4–4–0 and 4–4–2 classes.

* * *

NEW offices, a large recreation room, dining rooms and kitchen provided for the good's staff were recently brought into use at Bricklayers' Arms goods station, South Eastern and Chatham Railway, the opening ceremony being performed by Mrs. Cosmo Orme Bonsor, wife of the chairman of the company. The building is part of the premises formerly used as a passenger station, where Queen Alexandra was received by King Edward, when Prince of Wales, when she arrived in England on March 7, 1863.



NEW BOLINGBROKE STATION: GREAT NORTHERN RAILWAY.

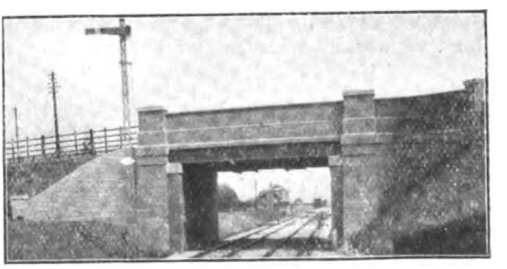
ON the 8th inst. (August) the Board of the Furness Railway will meet to consider the question of the declaration of an interim dividend on the Consolidated Ordinary Stock of the Company, and the decision of the Directors will be announced the same day.

* * *

MR. WALTER WYLIE COUBROUGH has been appointed Resident Engineer of the Midland and Northern Railways of Uruguay. Mr. Coubrough has been a member of the engineering staff of the Midland Railway of Uruguay during and since its construction, a period of 25 years.

* * *

THE Great Northern Railway Company have opened the new railway which has been constructed from Kirkstead to Skegness, the bracing resort on the Lincolnshire coast. The new line does not affect the Skegness traffic from London, but will render the place more easily accessible from Lincoln, Sheffield, Manchester and other large centres. It is 15½ miles in length, and begins at a junction with the Lincoln to Boston line about 1½ miles south of Kirkstead, terminating at Bellwater Junction, between East Ville and Little Steeping on the Boston to Firsby line. New stations have been provided at Coningsby (2 miles 73 chains from the junction), Tumby Woodside (5 miles 34 chains), New Bolingbroke (7 miles 54 chains), Stickney (9 miles 72 chains), and Midville (12 miles 43 chains). The service includes five through trains from Lincoln to Skegness each week-day, with a corresponding number of trains in the reverse direction. The quickest of these is timed to perform the journey in 1 hour 23 min. A through express leaves Sheffield each week-day at 8.35 a.m., and travelling *viâ* Retford, Lincoln, and the new line, is due to reach Skegness at 11.7 a.m. In the reverse direction a through train leaves Skegness each week-day at 8 p.m. and arrives at Sheffield at 10.30 p.m.



VIEW FROM UP PLATFORM, STICKNEY STATION: GREAT NORTHERN RAILWAY.

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PRESIDING at the second annual meeting of the local branch of the Royal Society for the Prevention of Cruelty to Animals, recently held at Barrow, Mr. Alfred Aslett, General Manager and Secretary of the Furness Railway, emphasised the keen sympathy entertained by the Furness Directors and himself in the objects of the Society. They would be pleased to know, he said, that with respect to the conveyance of dogs by railway, arrangements had been made for the provision of water at certain railway stations, if the sender would indicate his requirement on the labels. It was hoped by this society and the N.C.D.L. that dogs could also be fed during transit by rail. That, however, was found to be a very difficult matter to arrange satisfactorily. The Furness Railway did all in its power to protect the swans on Windermere, particularly during the time they were on their nests laying their eggs, and afterwards bringing up the young cygnets. They had recently been disappointed in connection with the swans' nest which could be seen from the trains between Newby Bridge and Lake Side. They arranged for a watchman to look after the nest day and night, but unfortunately the cygnet born the previous week had disappeared, and the other eggs were not hatched. In March last the Furness Company came to an understanding with the Board of Agriculture for the importation of Irish cattle at Barrow Docks from Belfast by the Midland Railway steamer. Since then they had brought in no fewer than 11,151 cattle, including 615 horses and pigs, and Mr. W. J. Young, the veterinary inspector to the Board of Agriculture, could tell them how satisfactorily the landing of those animals had been effected. In fact, only one cow was injured.

* * *

MR. C. A. LAMBERT, Hull District Superintendent of the North Eastern Railway, has been appointed Divisional Goods Manager, Newcastle, in succession to Mr. E. H. Hiley, who has resigned to become General Manager of the New Zealand Government Railways. Mr. C. S. Page, District Goods Manager, Leeds, has been appointed District Superintendent, at Hull, in succession to Mr. Lambert. Both appointments took effect as from the 1st July last.

* * *

THE Midland 4–4–0 locomotive, No. 499, fitted with superheater, has had an extended period of trial on the Somerset and Dorset Joint Railway, where it was still employed in the second week in July. The trials began in March last.

* * *

THIS year the railwaymen's annual exodus from Swindon, known as "Trip Day," was fixed for Thursday, July 10. The Great Western Parcels Department had their powers tested for several days before that date in dealing with the collection, labelling, and preparation for dispatch of over a thousand packages, which constituted the "luggage in advance" of several thousand Swindon railwaymen, and their wives and families. On July 8 three van-loads of luggage—about 570 packages—were collected and next day a similar number was garnered by three lorries and a handcart, which it was expected would be busily employed from morning till evening. The day before there was a huge stack of luggage on the milk bank siding waiting to be transferred into four capacious railway vans. The majority of the "trippers" began their holiday on the morning of July 10, but a few thousands, whose destinations were stations beyond Par (Cornwall) and some Welsh resorts, started late the previous night and were due to reach their holiday quarters early the next morning. Including the three trains despatched from the west and Pembroke Dock on the Wednesday night, there were altogether 23 specials, of which 20 were got away in the course of two hours from 4.55 a.m. on the morning of "Trip Day." For this to be accomplished was a triumph of organisation and the smoothness of the arrangements reflected great credit on the officials. Mr. Griffiths, Assistant Divisional Superintendent from Bristol, superintended the despatching of the trains, and excellent service was rendered by Mr. F. G. Davies (the stationmaster), Inspectors Winter, Sparkes, Rochester, Bishop, Fido, and the Locomotive Department Staff. The following figures approximately convey the number who travelled to different points of the compass. For Paddington, about 1,994 adults and 1,017 children left by three trains; for Weston-super-Mare (about 4,600), Newton Abbot and Plymouth, 6,183 adults and 4,428 children; Weymouth, 2,831 adults and 2,651 children; Swansea, Pembroke Dock and Neyland, 1,866 adults and 1,163 children; Manchester, Birkenhead, etc., 1,315 adults and 639 children; a total of, in round figures, 24,000. The works re-opened at 9 a.m. on Thursday, July 17.

* * *

FEW holiday districts are better served than the Norfolk Broads. The Great Eastern Company issue cheap tickets and provide a convenient train service to Cromer, Sheringham, Oulton Broad, Yarmouth, Lowestoft, and Wroxham, while the Midland and Great Northern Joint Railway offers very good facilities to those who desire a restful vacation cruising on the wild reed-surrounded lakes of East Norfolk. From the North the Broads are reached through Lincoln, *viâ* Spalding, Ely and Norwich, by the Great Eastern Railway, by the Great Northern Railway through Peterborough, or by the Midland Railway *viâ* Laxby and Bourne and the Midland and Great Northern Joint Line. The Norfolk Broads Yachting Co., Ltd., of Queen Street, Norwich, believing the attractions of the district have only to be made known to be appreciated, are prepared to forward an illustrated pamphlet post free to all applicants who mention the RAILWAY MAGAZINE. This firm likewise offers the visitor the conveniences of a large and perfect organisation. They possess boat yards at Wroxham and Potter Heigham, and have at their disposal a large and excellently-appointed fleet of yachts of all sizes and descriptions. Any number of short cruises may be taken from Potter Heigham, and only those who have tried it know what real rest and pleasure such a holiday affords.

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GREAT Western engines carrying the older pattern of parallel boiler, with dome, which have been recently fitted with the top feed apparatus include a 7 ft. 8 in. single, No. 3039, "Dreadnought," and No. 3283, "Comet" (late No. 3315), one of the "Pendennis Castle" type. *Marigold*, the 4–4–0 Great Western engine illustrated on the cover of the July RAILWAY MAGAZINE, has been renumbered from No. 4115 to 4163. One of the latest of the same company's four-cylinder express passenger engines (4–6–0 type), is No. 4045, *Prince John*.

* * * *

APPOINTED in January last Outdoor Goods Manager of the Southern Division, Mr. C. Lowndes has now been chosen to fill the vacancy created by Mr. Kinsman's advancement to the position of Chief Goods Manager, London and North Western Railway. Mr. Lowndes has been in the service of the London and North Western Railway since 1883, and has had a wide experience of goods management in different districts of the company's system. The following other changes are also announced: Mr. W. A. Ree has been appointed Outdoor Goods Manager for the Southern Division, in place of Mr. Lowndes. His office is at Euston. Mr. L. A. P. Warner becomes Outdoor Goods Manager for the Northern Division, in succession to Mr. W. A. Ree, his office being at Exchange Station, Manchester; Mr. G. T. Phizackerley has been appointed District Goods Manager at Liverpool, in place of Mr. Warner; Mr. H. Thompson has succeeded Mr. Phizackerley as District Traffic Superintendent at Chester; and Mr. T. E. W. Guest has been appointed District Traffic Superintendent at Swansea, in place of Mr. Thompson.

* * *

DURING August Bank Holiday period the Metropolitan Railway Company will amplify their usual excursion arrangements, and cheap return tickets will be issued on Friday 1, Saturday 2, and Sunday 3 August from all the London stations, to Chorley Wood, Chesham, Great Missenden, Wendover, Aylesbury, Waddesdon and Brill, available for return on the following Sunday 3, Monday 4, or Tuesday 5. On Saturday, August 2, half-day tickets will be issued by certain trains to Eastcote, Ruislip, Ickenham, Uxbridge, Pinner, Northwood, Rickmansworth, Chorley Wood, Chesham, Amersham, Great Missenden, Wendover and Aylesbury. On Sunday, August 3, day and half-day tickets will be issued by certain trains from all Metropolitan stations. On August Bank Holiday a special augmented service of trains will be run between Baker Street, Willesden Green, Harrow, Ruislip, Uxbridge, Rickmansworth, Chesham, Wendover, and Aylesbury. Day excursion tickets will be issued by certain trains to Chorley Wood, Chesham, Amersham, Great Missenden, Wendover, Aylesbury, Waddesdon, Quainton Road, Wotton, Brill, Grandboro' Road, and Winslow Road; as well as cheap tickets by all trains from Baker Street up to 5.40 p.m. to Rayner's Lane, Eastcote, Ruislip Manor, Ruislip, Ickenham and Uxbridge. During the holidays relief trains will be run as required. Pedestrian tour and bicycle tour tickets will be issued to those desirous of taking the train to one point and returning from another.

CONTINUING the policy of gradually renaming stations where desirable to avoid possible confusion, or to indicate more accurately the districts served, the London and North Western Company announce that in future Leamington (Avenue) station will be called "Leamington Spa," and Overton (on the Northampton and Peterborough branch) "Orton Waterville."

* * *

IT is officially announced that arrangements have been completed between the proprietors and the North British Railway Company whereby the Invergarry and Fort-Augustus line will be re-opened for traffic on August 1. The service will be very similar to that which was in operation prior to the closing of the railway.

* * *

"POPPYLAND" is the suggestion offered by the cover of the Great Eastern Railway's programme of August Bank Holiday excursions, the design including three of the scarlet flowers on a green ground. Miss Prytherch is again the artist, and with her usual skill she has obtained a good effect by simple means. The text gives particulars of numerous facilities, week-end, period, excursion, day and half-day, suited to all requirements—covering associated railways as well as all parts of the Great Eastern system. The usual half-day trips to Clacton-on-Sea will be run on Bank-holiday. For some weeks past a half-day express trip has been run on Wednesdays to Dovercourt and Harwich corresponding to the Thursday trip to Clacton-on-Sea. The fare is the same, 3s. As regards the holiday arrangements, trains will be duplicated as required, and on Friday and Saturday the down Norfolk Coast Express will be run in three sections, all with restaurant cars—1 p.m. for Cromer only, 1.6 p.m. for West Runton and Sheringham, and 1.10 p.m. for North Walsham, Mundesley, Trimingham and Overstrand.

* * *

IMPORTANT changes are being made at the Broadstone (Dublin) terminus of the Midland Great Western Railway. The old roof, which has sheltered the station since it was built in 1850, is being taken down and replaced by a modern structure. The work, which was commenced in March last, is being accomplished without involving any interference with train movements at the platforms below, though some of the central lines are necessarily utilised for cranes and material for the time being. The new roof will be 500 ft. long (the full length of the station) and 120 ft. wide, made up of two equal spans of 60 ft. each, comprising steel trusses, carried on the existing side walls and in the centre steel lattice girders and ferro-concrete columns. Each span will have four bays of glazing running the full length. For ventilation there will be two lines of louvres. The timber portions consist of pitch pine. All the steel work of the trusses is being built at the company's workshops, Broadstone, and only certain portions of the roof covering will be done by contract. The work was designed and is being carried out by Mr. W. P. O'Neill, Chief Engineer, and Mr. A. W. Bretland, Assistant Engineer.

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As a companion to the frontispiece presented with our last issue, we now reproduce a series of views of trains on Scottish railways. The Highland express is shown rounding Ben Charuinn (3,004 ft.) near Drumochter summit, 1,484 ft. above sea level, the highest point reached by any railway in Great Britain. One of Mr. Drummond's later 4–6–0 engines, No. 35 *Urquhart Castle* is employed, and the "Engine Following" board carried in front of the engine should be noted. Although all heavy trains are assisted to Dalnaspidal, the pilots are usually there taken off, and the final two miles to the summit completed unaided by the train engine. A load such as that of the train illustrated would however be hauled by one locomotive all the way between Perth and Inverness. Loads sometimes reaching 375 tons are by no means unusual over this section, particularly in the case of the sleeping car trains, and even with these duplication may be called for during the height of the season. On the Great North of Scotland Railway the Royal Train is shown on the "Deeside" line from Aberdeen to Ballater. The London and North Western royal train is being hauled by two Great North engines, of Mr. Pickersgill's latest design. In the centre one of Mr. Mackay's Caledonian photographs is reproduced, the train being the 10 a.m. from Glasgow, drawn by one of Mr. McIntosh's large 4–6–0 engines No. 907. This is now fitted with the Schmidt superheater, and the damper-operating steam cylinder may be seen on the side of the smokebox. The North British view is of the 1.20 p.m. express Aberdeen to Edinburgh passing Broughty Junction signal cabin, the engine being one of Mr. W. P. Reid's earlier "Atlantics," No. 876, *Waverley*. Next to the engine is a through carriage for Bristol. In the case of the Glasgow and South Western Railway the train seen is the 11 a.m. from St. Enoch to St. Pancras, photographed near Neilston. This train—allowed 2 hours 28 min. to Carlisle, with stops at Kilmarnock and Dumfries—includes a through carriage for Bristol, The engine is one of Mr. Manson's later 4–6–0 class, of the series immediately preceding those fitted with Schmidt superheaters.

* * *

WITH the completion of the 87 miles of line from Cumberland, Maryland, to Connellsville, Pennsylvania, the Western Maryland Railway became a through trunk railway to the West. It has entered into a 99-year contract with the Pittsburg and Lake Erie Railroad for a joint interchange of traffic, and it is expected that a heavy movement of freight, both domestic and foreign, will seek an outlet to the sea over this new line to Baltimore, which is said to be the shortest from the Great Lakes to a port of export. It is proposed to construct a dam across the Susquehanna River at Conowingo, Maryland, as a nucleus for a hydro-electric development and electric transmission system. The dam will be constructed 10 miles below the present dam of the Pennsylvania Water and Power Company at McCalls ferry, and the cost will exceed £2,000,000.

* * *

THE Odessa-Bakhmatch line has been opened temporarily from Odessa to Berezovka (70 miles from Odessa). There is now regular traffic between Bakhmatch and Tcherkassy, and the line will be ready in January, 1914. The bridge across the Dnieper was finished in February last. It is 1,200 yards long. Construction of the Akerman-Leipsigskaya, Rovno-Zmiev, and Kherson-Kharkov Railways has been sanctioned. The Russian Government will undertake preliminary work for a line from Lozovaya to Kazatin.

* * *

DURING 1912 the total production of all kinds of rails in the United States amounted to 3,327,915 gross tons, as compared with 2,822,790 gross tons in 1911, an increase of 505,125 tons. The output of Bessemer steel rails in 1912 amounted to 1,099,926 gross tons, against 1,053,420 gross tons in 1911—an increase of 46,506 tons—and of open-hearth steel rails to 2,105,144 tons, as compared with 1,676,923 tons in 1911—an increase of 428,221 tons.

* * *

SOME time since it was proposed to construct a line of railway between Chao Chou Fu and Canton *viâ* Huichou—a distance of about 240 miles—but it now seems to be doubtful whether the scheme will mature until a more stable government has been established in China. The railway would, of course, involve a considerable expenditure.

* * *

THE new railroad mileage constructed in the United States during 1912 was the smallest for 15 years.

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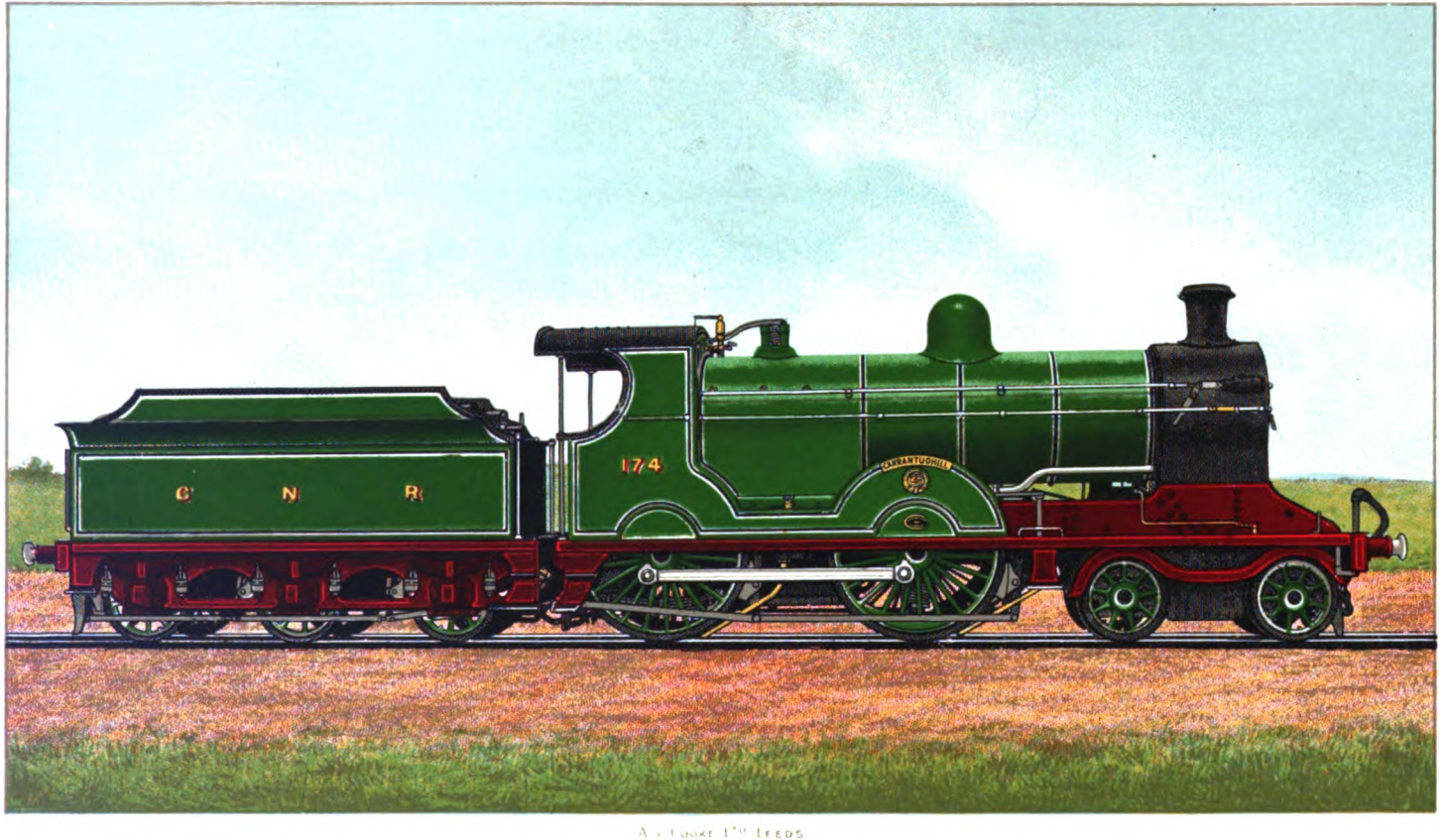

A. Cooke Ltd. Leeds

GREAT NORTHERN RAILWAY OF IRELAND FOUR COUPLED EXPRESS LOCOMOTIVE, No. 174, "CARRANTUOHILL."

FITTED WITH SCHMIDT SUPERHEATER. MR. G. T. GLOVER, LOCOMOTIVE ENGINEER.

GAUGE, 5FT. 3IN. CYLINDERS, 19IN. DIAMETER, 26IN. STROKE.

STEAM PRESSURE, 165LBS. PER SQ. IN. DIAMETER OF COUPLED WHEELS, 6FT. 7IN.

TOTAL HEATING SURFACE, 1366 SQ. FT. GRATE AREA, 22·9 SQ. FT.

WEIGHT OF ENGINE IN WORKING ORDER, 52 TONS 2 CWT. ENGINE AND TENDER, 82 TONS 13 CWT.

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Photo] [*G. F. Burtt.*

EXTERIOR OF EASTBOURNE STATION.

Eastbourne: Its Attractions and Train Services.

By J. F. GAIRNS.

UNLIKE its neighbours, Brighton and Hastings, history includes very few references to Eastbourne. It is supposed to occupy the site of the Roman city of Anderida, and in the seventeenth century Eastbourne possessed some local importance, being "an hundred within itself," and holding "a court leet annually, with other powers and privileges." But in 1800 it could only be described as a "delightful village," with "seahouses chiefly frequented by the company," fine prospects, fertile soil, trees more luxuriant than usual on the sea-coast, excellent walks and drives, and "remarkably good bathing." There were "two good inns," a theatre having "a small though decent company of performers during the season," a subscription ball-room, "likewise a bank." Indeed, as the writer from whom I quote remarks: "Nothing seems wanting to render this a most desirable summer retreat, except more lodging houses near the sea"—a reproach which will certainly not apply now. Its traffic cannot, however, have been very great, for a stage coach to and from London thrice a week during the summer months, and a "daily post" sufficed as regards public service transportation. At that time the resident population was only about 1,800, and for many years afterwards development was very gradual. In 1851 this figure had not quite doubled; but from that date, nearly coincident with the opening of the railway to Eastbourne itself (1849), progress was much more rapid, until at the present time it is upwards of 50,000, to which must be added many thousands of regular and occasional visitors. This distinction is, in the case of Eastbourne, a very important one, seeing that there are thousands of people who now visit Eastbourne regularly at Easter and Whitsuntide, as well as during the usual holiday period, with occasional "week-ends" thrown in.

It is difficult to state briefly wherein lies the charm of Eastbourne. It is never dull; but it is quiet, even in the height of the season. It is fashionable and select; yet

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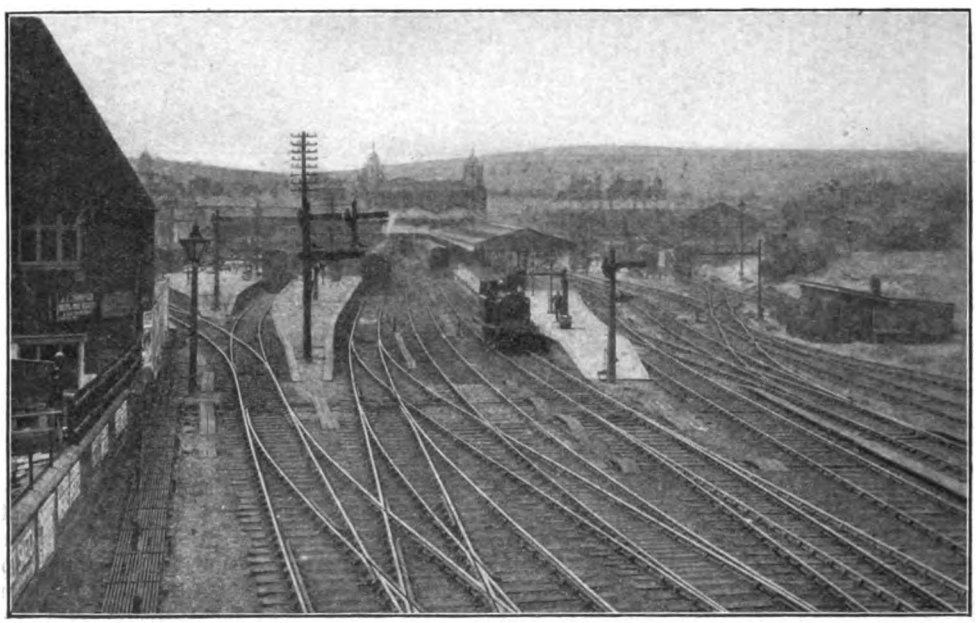
the ordinary family party spending a hard-earned and much-required summer vacation is quite comfortable and well catered for. The beach is not spoiled by an army of hawkers, amusement booths, stalls, and what-not; yet there is adequate provision for most holiday requirements. The "front" itself is beautifully laid out, with a single promenade extending from the Redoubt, at the east end, to the Pier, and upper and lower promenades thence to the Wish Tower and for about half-a-mile beyond. For part of the way there are carpet gardens and well-kept lawns on the higher level, and for the whole length of about two miles the sea is faced by a fine series of first-class hotels, boarding houses, and private residences, all of a class entirely in keeping with the modern character of Eastbourne. Inland, but never far from the sea, are fine thoroughfares, those devoted to business having shops to suit all purses and all requirements; those of a private character lined with wide spreading trees and with beautifully laid out gardens and grounds on either side.

The town is also an important scholastic centre, there being about 100 high-class schools for boys and girls, besides several special establishments of the same class. Indeed, the conveyance of the young people to and from Eastbourne is a very appreciable factor in the railway traffic at the station, while "half-term" generally brings many of the parents to spend the brief holiday with their children in the town.

Eastbourne also possesses a beautiful inland retreat in Hampden Park, presented to the town by Lord Willingdon, the present Governor of Bombay. The railway company has provided a modern station, with a good service of trains, while motor omnibuses run between the pier and the park gates at frequent intervals. Round the park are many well designed villas, and the district is rapidly developing into a suburb of Eastbourne, and will probably be directly linked with the town before very long. Apart from its holiday character, Eastbourne also has several districts containing high-class villas and residences.

As a centre for drives and excursions, Eastbourne is highly favoured. The drive to Beachy Head is, of course, in greatest request, and thousands of passengers are daily conveyed to the summit and back again by brake, wagonette or char-à-banc, the usual fare being 1s. return. Indeed, this drive is often repeated even by those familiar with it, because of the wonderful views over the town, the sea, and the surrounding country which are obtained as the winding road built by the Duke of Devonshire is gradually climbed or slowly



Photo] [*G. F. Burtt.*

EASTBOURNE STATION, GENERAL VIEW.

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descended. Other favourite drives are to Pevensey Castle, Hampden Park, Abbott's Wood, Willingdon, and even further afield to Wilmington Priory, Hurstmonceaux Castle, Battle Abbey, etc. As regards other features I may mention that Eastbourne is well favoured in respect of average hours of sunshine, light rainfall, freedom from cold winds; its death rate is very low, sanitation and water supply are good, and it is well supplied with pleasure and amusement agencies to suit all tastes.

It was not until 1846 that the railway came anywhere near Eastbourne, the Brighton-Hastings line being then opened for traffic. The Keymer-Lewes section brought into use in 1847 rendered access to the eastern lines more convenient than *viâ* Brighton, and on May 14th, 1849, the Eastbourne branch was publicly used for the first time. By the courtesy of Mr. W. Holdaway, stationmaster at Eastbourne, I am able to reproduce an old engraving depicting a scene at the opening of the line. The branch from Polegate to Hailsham was made about the same date, but the complete route from Tunbridge Wells to Eastbourne *viâ* Hailsham was not available until 1880. The alternative route *viâ* Lewes was opened in sections in the late 'fifties and early 'sixties. A remarkable feature of the Eastbourne traffic is the fact that, for reasons which need not be detailed, the South Eastern Railway is paid a percentage of the receipts from the Eastbourne traffic, on the understanding that it does not penetrate further into that area. At one time two South Eastern trains (1st and 2nd class only) were run daily between London and Eastbourne *viâ* Tunbridge Wells, Heathfield, Hailsham and Polegate, but the service was soon withdrawn. Eastbourne is now, to all intents and purposes, a preserve of the "Brighton" company as far as the general public is concerned, and except for the daily appearance of London and North Western vehicles on the "Sunny South Special," and occasional South Eastern and Chatham vehicles on summer "coastal" services, one sees none but Brighton engines and carriages at Eastbourne.

Photo] [*G. F. Burtt.*

CIRCULATING AREA, EASTBOURNE STATION.

The station is a terminus, abutting angularly upon Terminus Road, the principal business thoroughfare in the town. The station buildings provide a good frontage and are surmounted by a clock tower. From the station yard the booking-hall gives access to the circulating area, a wide space surrounded by waiting rooms, refreshment and dining rooms, bookstall, and other station offices and buildings. There are two double-sided platforms allocated respectively for departures and arrivals, the latter being adjacent to a cab yard and having at its outer end a short carriage

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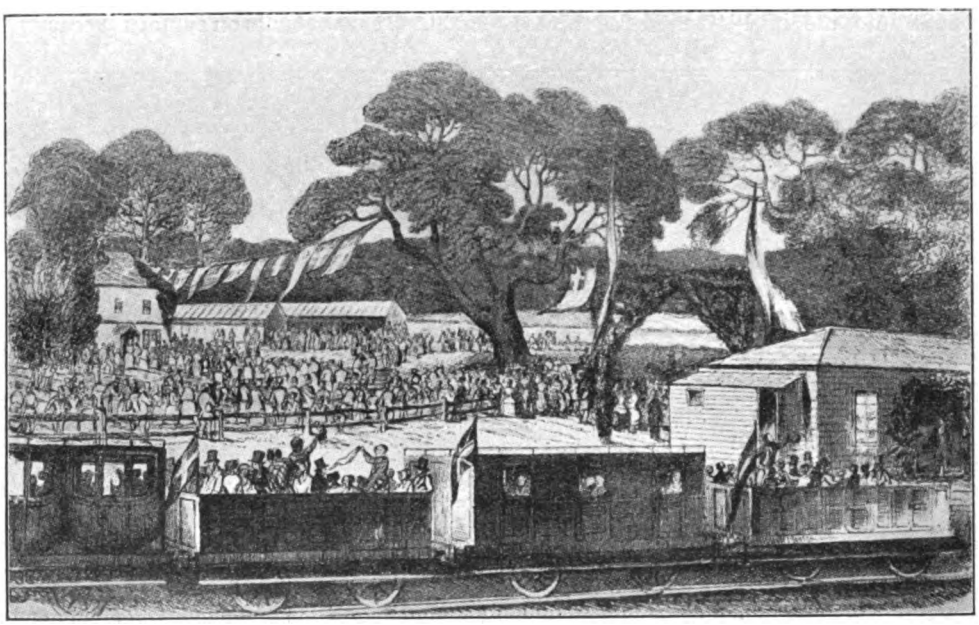
loading dock. At times, however, all platforms are used as convenient, either for arrivals or departures. Beyond the platforms are various carriage sidings and a goods yard, with a large and well-equipped depôt, while the engine shed is placed a short distance down the line. Between the arrival and departure platforms is a centre road to enable engines to run round their trains, or to receive spare vehicles and waiting locomotives. The platforms are long and wide, with ample verandah roofs extending nearly from end to end, and the design of the station as a whole accords with modern ideas as to what a railway station should be.

Examination of a map of the Brighton system shows that Eastbourne is accessible from London through Lewes, either *viâ* Brighton, *viâ* Wivelsfield, *viâ* East Grinstead, or *viâ* Uckfield; also through Hailsham and Polegate and the Tunbridge Wells section. The Polegate spur enables trains to run direct from Eastbourne to Hastings. The last-mentioned is usually a local facility, though it counts for much with the excursionist, as the services which use this route afford convenient means for visiting various places of interest in the neighbourhood. Occasionally, however, trains between London or Brighton and Hastings run into



OPENING OF THE EASTBOURNE RAILWAY, THURSDAY, MAY 12, 1849.
From an old print drawn and engraved by Thos. Henwood.

Generally, the platforms are treated as closed, access being only obtained by passing a collector, but on the arrival side this is not observed so rigidly in the case of trains for which it is convenient to collect tickets at Polegate or other previous station called at.

The motor omnibuses operated by the town—Eastbourne provides the most important instance of municipal motor omnibus services instead of tramways—radiate in all directions, several routes passing the station. About 50 taxi-cabs as well as ordinary cabs and carriages and motor omnibuses belonging to the principal hotels are licensed to use the company's premises to meet the trains.

Eastbourne and then out again. All the other routes specified pass through lovely country and reveal the beauties of Sussex to a degree which renders a journey by any route interesting and enjoyable. The principal services are, however, operated *viâ* Wivelsfield and Lewes, most of the other routes being followed by stopping or local trains, whose importance relates principally to the stations served on the way.

As already indicated, Eastbourne is in great favour all the year round for week-ends and short visits, so that it calls for train services during winter, spring and autumn almost as extensive as those required in the summer, though the trains

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may not always reach summer loads. Indeed, one may also claim that the "holiday season" extends from Whitsuntide until late October, the rest of the year being favoured in the same way as Brighton and other south-coast resorts for week-ends and short holidays by those who are able to take them at such times. The mildness of the climate, the good average of sunshine, and other factors also account for a considerable number of invalids and convalescents at all periods.

The difference between the summer and winter timetables are therefore not so notable as in the case of many other resorts. In fact, except for the summer excursions and a few special arrangements, most of the principal services are provided all the year round, though in one or two cases through summer trains are replaced in winter by through carriage connections with, or divisions of, Brighton trains. As regards day and half-day excursions, Eastbourne is well served from London; but it will be sufficient to devote attention mainly to the usual trains. For a distance of 66 miles, a standard timing of 90 minutes, sometimes with one stop included, or with five minutes or so added if two or more stops are made *en route*, is decidedly good. It may not altogether satisfy speed enthusiasts, unless due consideration is given to the fact that the route involves gradient difficulties that, although not perhaps very severe, are certainly far from negligible, while the traffic, curve and junction hindrances are really serious factors in proportion to the distance covered. The recent introduction of 85 minute expresses is a sufficient answer to criticisms of this kind, and these schedules entail really fine work on the part of the locomotives employed. On the whole, however, I prefer to describe the standard as a 90-minute one, seeing that quite a galaxy of expresses are given this timing or a few minutes faster or slower at all hours when through traffic is specially important. The train service, principal trains only, is sufficiently interesting to warrant setting forth in detail:—

DOWN TRAINS.

		NC	NFG	E	BP	EH	ASH	FH	TE	SPF	PBH
		a.m.	a.m.	a.m.	a.m.	p.m.	p.m.	p.m.	p.m.	p.m.	p.m.
Victoria	dep.	8.20	9.0	9.45	11.15	12.0	1.10	1.25	—	—	3.20
London Bridge ..	dep.	8.7	—	—	—	—	—	1†25	2.0	2.3	—
Eastbourne ..	arr.	9.57	10.42	11.35	12.45	1.48	2.40	3.19	3.52	4.2	4.55

		EH	KF	PBL	BH	TDO	F	RD	OE	OBW
		p.m.	p.m.	p.m.	p.m.	p.m.	p.m.	p.m.	p.m.	a.m.
Victoria	dep.	—	4.30	—	5.20	—	6.45	8.45	9.55	12.5
London Bridge	dep.	4.5	—	5.5	—	5.56	—	8.45	—	—
Eastbourne	arr.	5.50	6.18	6.35	6.51	7.38	8.34	10.34	11.44	1.35

A—non-stop. B—1 stop. C—2 stops. D—3 stops. E—4 stops. F—5 stops. G—Slips Brighton vehicles at Hayward's Heath. H—Slips Hastings carriages at Polegate. M—Mondays only. N—Not Mondays. K—Eastbourne portion slipped at Three Bridges. L—Slips vehicles at Horley, also at Hayward's Heath on Saturdays. O—Eastbourne vehicles slipped at Hayward's Heath. P—Pullman Car. R—Combined with Continental train. S—Saturdays only. T—Not Saturdays. W—Wednesday nights only. †—Leaves at 1.15 p.m. on Saturdays.

It should be noted that the 11.15 a.m., 1.10 (Saturdays only), 3.20 p.m., and 5.20 p.m. from Victoria, are 90, 95 or 91 min. trains, and the 5.5 p.m. from London Bridge and the 12.5 midnight slip service from Victoria on Wednesday nights, are both timed in 90 min. Moreover, although four of these services are booked in 1½ hours exactly, and one in 91 min., only the 1.10 p.m. Saturday train from Victoria makes the complete non-stop run.

In the up direction the arrangements are equally interesting. The same reference letters as are above employed may again be used as far as they apply:—

		F	PB	AP	A	PB	X	A	D	D
		a.m.	a.m.	a.m.	a.m.	p.m.	p.m.	p.m.	p.m.	p.m.
Eastbourne	dep.	7.30	8.30	9.35	11.45	2.25	5.10	6.15	7.50	9.30
London Bridge	arr.	9.11	10.0	—	—	4.0	—	—	9.30	—
Victoria	arr.	9.20	10.10	11.0	1.10	4.0	6.40	7.40	9.35	11.11

Additional reference:—X—Calls at Three Bridges on Tuesdays.

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Here the 9.35 and 11.45 a.m., and the 6.15 p.m. expresses to Victoria are 85 min. trains, all non-stop, with the 8.30 a.m. to London Bridge (one stop, also slipping Victoria coaches at East Croydon), and the 5.10 p.m. to Victoria with one stop on Tuesdays, as 90 min. trains. Most of the other trains mentioned are nearly as good, but it should be noted that the number of trains mentioned is considerably less than that quoted in the down direction. This is not due to there being actually fewer trains, but is explained rather by the more definite allocation of the traffic to certain hours, so that fewer secondary trains call for inclusion.

Sunday traffic is an important item. The earlier trains are rather slow and largely intended for excursionists. At 10.45 a.m. the "Eastbourne Limited" leaves Victoria. This now takes third-class passengers, but, curiously does not convey first-class passengers, if any, who are not prepared to pay the Pullman car excess. Special Pullman day return tickets at 12s.6d. are issued by this train. The 11.15 from Victoria also takes a Pullman car, but occupies 108 min. with 6 stops. Other down trains hardly call for attention. The evening trains commence with the 5.15 return "Eastbourne Limited," which brings passengers back to Victoria in good time for dinner. It is again a 90 min. non-stop service. The 5.55 p.m. (Pullman car) reaches Victoria at 7.40 with four stops.

At busy periods relief trains are frequently required, in which case the journey between Victoria or London Bridge and Eastbourne is often made without intermediate stops by the advance portion.

Other train services centreing upon Eastbourne are of a local character, or come within special categories to be considered later. On the Hailsham line the trains are either through to or from Eastbourne or have convenient Eastbourne connections. By the 11.10 a.m. and 3.45 p.m. trains from Victoria through carriages for Eastbourne are conveyed over this route: the return arrangements applying to the 7.55 and 9.55 a.m. trains from Eastbourne. On the Eastbourne-Hastings division, local traffic is largely catered for by motor trains, consisting of a Stroudley tank engine and one, two or four bogie carriages as trailers, and numerous halts are available. Stonecross halt is between Polegate and Pevensey station. Thence to Bexhill there are no fewer than four halts—Pevensey Bay, Norman's Bay, Cooden and West Bexhill. Between Bexhill and St. Leonard's is Glyne Gap halt. Between Lewes and Brighton there are also frequent trains and motors, and by means of the plentiful local train and motor services it is a simple matter to reach most places of interest in the neighbourhood. Numerous cheap facilities are offered from Eastbourne, as well as favourable arrangements for visiting holiday resorts further afield. In conjunction with the steamers calling at Eastbourne, arrangements are also

Photo] [*G. F. Burtt.*

ENGINE SHED AND WATER SOFTENER.

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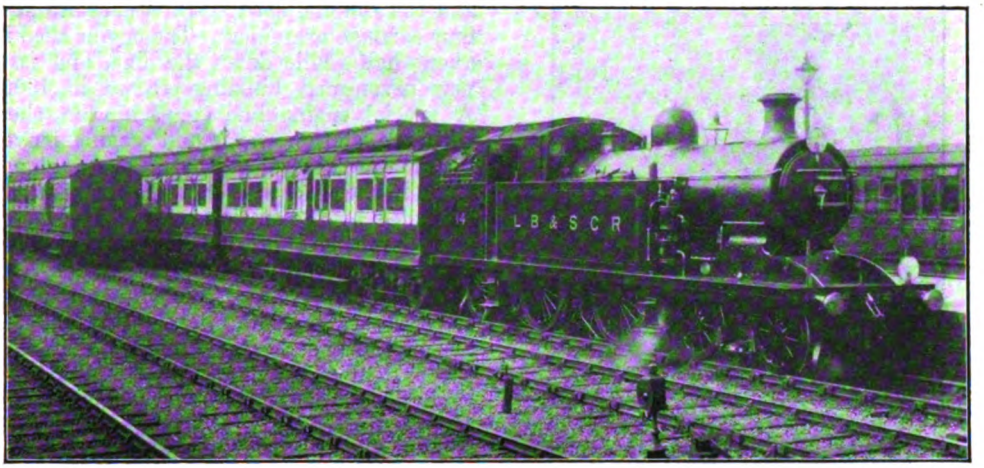

Photo] [*G. F. Burtt.*

THE "SUNNY SOUTH SPECIAL" LEAVING EASTBOURNE FOR THE NORTH.

in force, permitting of combined rail and steamer journeys.

The railway coastal services running on Tuesdays during the summer may be briefly referred to. During the summer months, the eastward train leaves Brighton at 9.5 a.m., and Eastbourne at 9.20 a.m., joining the South Eastern and Chatham Railway at Hastings, and serving Canterbury, Dover, Deal, Folkestone, Margate, and Ramsgate. The return train leaves Dover at 6.10 p.m., and reaches Eastbourne at 8.34 p.m. Passengers can also leave Eastbourne at 9.55 a.m. and join a through train from Brighton to Portsmouth, Southampton, Bournemouth, and Salisbury, with corresponding return arrangements due at Eastbourne at 5.45 p.m.

Reference may also be made to the "Sunny South Special"—a vestibuled corridor carriage, luncheon and tea car train, with through vehicles between Eastbourne, *viâ* Brighton, Clapham Junction, and Willesden Junction, and Birmingham, Manchester and Liverpool. This train, leaving Eastbourne at 11.35 a.m., is very convenient indeed for passengers travelling between northern towns and the north-west

Photo] [*F. E. Mackay.*

3. 20 P.M. VICTORIA–EASTBOURNE EXPRESS, 4–4–0 LOCOMOTIVE NO. 70.

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Photo] [*G. F. Burtt.*

MR. W. HOLDAWAY.

Stationmaster.

of London and Eastbourne, and is highly favoured for that reason. The corresponding southward train reaches Eastbourne at 6 p.m. In the ordinary way these are heavy trains, and at busy periods involve big loads, and the running of relief trains from and to Brighton if not throughout from and to Eastbourne is sometimes entailed. As regards fares and facilities, I may mention that tourist tickets, cheap week-end, day and period excursions, and various cheap and special arrangements are in force, while Eastbourne is also concerned in a series of circular tours arranged by the Brighton company or in conjunction with neighbouring lines, so that in one way or another there is something to suit everyone.

The passenger staff at Eastbourne under Mr. William Holdaway numbers 93, including ticket collectors, porters, signalmen, guards, booking and parcels clerks, etc. There are also numerous outside porters licenced to use the station. The goods department is under the charge of Mr. Briggs, with about 100 men, while Mr. R. J. Glendening, locomotive foreman, has about the same number, including drivers, firemen, and the running shed staff. There are also four carriage examiners. The engine shed is about half-a-mile down the line, and is a new seven-road building erected in 1906. A special engine line connects the shed with the station yard, and engine movements are controlled by a small signal cabin in the shed with suitable instruments governed by the station cabin. The latter is a large box of 115 levers. Twenty-nine engines are at present under Mr. Glendening's charge, including two of the superheater "Atlantics"—Nos. 423-4—one of the superheater express tanks—No. 88—several of the large 4–4–0 and rebuilt engines, one of the large goods engines, No. 100, the first of Mr. L. Billinton's 0–6–0 tank engines (illustrated elsewhere in this issue of the RAILWAY MAGAZINE), and a number of the ordinary passenger, goods and tank locomotives. Outside the shed is a Boby water softener, and this is clearly shown in the view of the engine depôt given on another page.

Particularly during the summer and frequently at other periods heavy loads are taken even on the principal and fastest expresses. The 85 and 90-min. trains often load up to 8, 9 or 10 or even more

Photo] [*G. F. Burtt.*

MR. R. J. GLENDENING.

Locomotive Foreman.

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Photo] [*E. S. Hallet.*

LONDON, BRIGHTON AND SOUTH COAST RAILWAY.

9.45 a.m. Victoria–Eastbourne express.
4–4–2 locomotive No. 422 (Schmidt superheater).

modern bogie carriages, with one or two Pullman cars, and with the difficult gradients south of Keymer Junction and the severe slacks imposed at Polegate, Lewes and Keymer Junction, high-class locomotive work is often involved.

Mr. Holdaway has now completed 42 years' service. Commencing as a clerk at Hassocks, he became stationmaster first at Bishopstone, near Seaford. Later he was transferred to Lewes Road, then to Southwick, and with 13 years at Horley, 5½ years at Dorking, 5 years at Tunbridge Wells, and 4½ years at Eastbourne, Mr. Holdaway has at present completed 35 years as a stationmaster. In his office at Eastbourne are to be seen illuminated testimonials from passengers using Lewes Road, Horley and Dorking stations when he was in charge there; while the recent presentation of a gold scarf pin by Princess Frederick Charles of Hesse, sister of the German Emperor, affords an indication of his present popularity in Eastbourne. Speaking of royalty, I may mention that many notable people visit Eastbourne either occasionally or frequently, and at one time the present King and Queen of Greece were well-known travellers to and from the station.

Mr. R. J. Glendening has completed 37 years' service with the London, Brighton and South Coast Railway. Commencing in the works and drawing office at Brighton in 1876, he was soon after transferred to the running department, and for 31 years he has occupied various responsible positions. He has been in charge at Eastbourne for nearly 3½ years.

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The Caledonian Railway Company:

PRESENTATION TO LADY BINE RENSHAW.

A CEREMONY which is perhaps unique in the history of railways was witnessed in the board room of the Caledonian Railway, when the directors and chief officers presented to Lady Bine Renshaw an excellent portrait of her husband, Sir Charles Bine Renshaw, Bart., the Chairman, as a mark of their sincere appreciation of his long and faithful services to the Company. The citizens of Glasgow and many others would have been only too glad to have had the privilege of contributing to the presentation, but the directors were anxious that the tribute should come solely from those who were in daily association with the revered and popular Chairman, who has held his present office for five years, after having previously served as Deputy Chairman. Sir Charles gives a great deal of his time to the business of the Company, and, as Mr. Donald Matheson, the General Manager, says, "Everyone realises how well he deserves this mark of appreciation of his fellow-directors."

The presentation was made by the Marquess of BREADALBANE, K.G., and the large company assembled included the Directors and their wives. Lady Bine Renshaw was accompanied by her daughters, Mrs. Ogilvie and the Misses Renshaw. The Marquess of Breadalbane, addressing Lady Bine Renshaw, said that never was any testimonial more ungrudgingly contributed to than was her husband's picture. It was resolved that it should be a gift entirely from the Board. This resolution was come to on account of the universal popularity of Sir Charles and the difficulty there would have been in drawing a line had they departed from the original proposal to confine the testimonials to themselves. To Sir Charles Renshaw he expressed high appreciation of the manner in which he had for so long filled the honourable position of Chairman of the Company, and the Directors with all the chief officers earnestly hoped that he might long be spared.

Sir CHARLES BINE RENSHAW, in acknowledging the gift, said he did not remember any occasion—excepting perhaps the occasional presence of a lady who had enlightened the proceedings of a deputation in connection, perhaps, with some obscured but interesting subject—on which they had seen ladies in the board room. It was quite true to say that during the last few years in connection with the administration of the Caledonian Railway Company they had had a very uphill battle, but his colleagues and the chief officers had made his task as Chairman a comparatively easy one, because they had all been united in the course that had been taken—a course, which was not altogether one a shareholder looking, perhaps, for an immediate dividend would have desired them to take, but one which in the broad and best interest of the Company it was essential they should take, and they had succeeded in placing the affairs of the Company in a far better position than they had occupied for a long period.

Sir Charles continued: Although I am approaching perilously near the age limit, which places all of us in connection with railway matters on the retired list—if I do vacate the chair I think we can look forward with confidence to my immediate successor seeing the fruition of the work which we have endeavoured to accomplish. Lord Breadalbane, I desire before I resume my seat to thank you and your colleagues for their great kindness to me personally during the term I have occupied the chair and been a member of this Board. I assume that Lord Breadalbane has had sufficient experience in connection with the chairmanship of the Caledonian Railway Company. I think he has been a Director for the long period of 31 years, and during that time he has seen five chairmen of the Company. Sir Charles Renshaw made a generous acknowledgement to the famous artist who had painted his portrait, and as his experience was typical of what often occurs when busy men are compelled to "sit," his tribute may be reproduced.

"But I should like to say" he remarked "that sitting for this portrait as I did, I do not think, ladies and gentlemen, I exaggerate the thing a bit when I say that I do not believe there is any man worse likely to sit for a portrait—sitting still had never been my fort. But Mr. Fiddes Watt has triumphed over the difficulty which he had with his subject, and I should just like, while expressing my gratitude to Mr. Fiddes Watt in connection with my sitting, to pay a tribute to Mrs. Fiddes Watt, for I am pretty sure had it not been for the charm of her companionship and her conversation the portrait would not have been so successful."

Lady RENSHAW added her own brief but earnest appreciation of the extreme kindness of the directors in giving her the portrait, saying that in her heart she was very grateful to Lord Breadalbane for the words he had spoken about her husband, and for the kind way in which he had presented the picture. She thanked every one of the Directors for having shared in the gift. She knew that it had nothing to do with her really, excepting that she was the wife of her husband.

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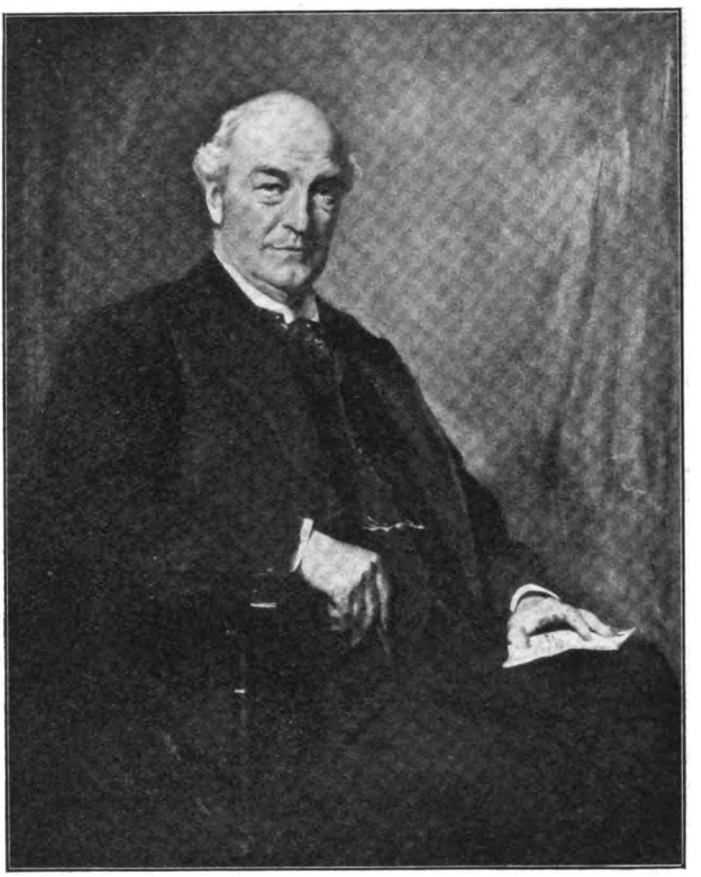

Sir Charles Bine Renshaw, Bart.
Chairman: Caledonian Railway Company.

The above is a reproduction of the portrait painted by Mr. Fiddes Watt and presented by the directors of the Caledonian Railway Company to Lady Bine Renshaw as an expression of their appreciation of Sir Charles Bine Renshaw's services as Director, Deputy Chairman and Chairman of the Caledonian Railway.

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Photo] *[R. H. Gregory.*

MIDLAND AND GREAT NORTHERN JOINT RAILWAY.

Dining Car Express from Cromer and Sheringham to London (King's Cross), near Wisbech.
4–4–0 Locomotive No. 49.

British Locomotive Practice and Performance.

By CECIL J. ALLEN.

THE subject under review in the present article—Midland express locomotive work between Hellifield and Carlisle—is one which requires no introduction, as readers will have been prepared in a measure for its perusal by the description of the gradients and details of the schedule times in force over this section, which appeared in the August issue of the RAILWAY MAGAZINE. Before going into a detailed description of the runs, which have as usual been tabulated for ready reference, I should like to point out a few general features in connection with the running. In the first place it will be noticed that the 13 runs shown are divided into three series. The first six consist of runs on which a pilot was taken to the summit, and the next three of unpiloted journeys, the whole of these nine trips being made on trains nominally non-stop from Hellifield to Carlisle. In the last four columns are shown unpiloted runs with the 1.30 p.m. express *ex*-St. Pancras, which makes a one-minute call at Appleby, and is allowed three minutes extra in running time in consequence. The variety of locomotives employed is fully described in the table, and therefore needs no further explanation.

It is not surprising that the initial booking of 4 min. for the 3¼ miles to Settle Junction presents some difficulty in achievement. In fact, the nearest approach to this "counsel of perfection" was a time of 4½ min., while the slowest time—curiously enough behind a compound piloted by a "Belpaire" rebuild—was one of 5¼ min. Conversely, the 21 min. uniformly allowed for the 14 miles of 1 in 100 from Settle Junction to Blea Moor was one of the most punctually observed times of all, despite the continuous uphill average of 40 miles per hour thereby involved. In order that the uphill work may be closely followed in each case, I have tabulated at the foot of the table the start-to-stop or pass times from Hellifield to Ais Gill, the passing times between Settle Junction and Blea Moor—which are now being dealt with—and the time from Horton to Blea Moor, the average speeds being all worked out. The last-mentioned figures give a good idea of the sustained speed on the 1 in 100 incline, independent of the impetus afforded by the descent to Settle Junction which precedes the commencement of the

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MIDLAND RAILWAY—HELLIFIELD TO CARLISLE.

				Non-superheater Engines.								Superheater Engines.					
Run No.		Distance—miles.	Schedule times—mins.	1	2	3	4	5	6	7	8	9	Schedule times—mins.	10	11	12	13
Engine No.				475	447	448	464	1032	996	522	1010	995		995	998	998	993
Type				6 ft. 6 in. re-built 4–4–0				comp'd	999	†4–4–0	comp'd.	999		999	999	999	999
Pilot to summit				78	396	312	245	340	465	—	—	—		—	—	—	—
Type				2–4–0	§4–4–0	‖4–4–0	2–4–0	*4–4–0	*4–4–0	—	—	—		—	—	—	—
Load (axles)				28	38	40	54	42	43	28	28	36		26	26	28	36
Load (tons)				190	260	270	365	285	285	190	190	255		175	175	190	245
Hellifield	dep.	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00
Settle Junction	,,	3¼	4	4.30	4.30	4.45	4.50	5.15	4.25	4.40	4.35	4.25	4	4.30	4.50	4.55	5.00
Settle	,,	5½	—	6.30	6.30	6.55	7.10	7.40	6.25	6.45	6.45	6.20	—	6.30	7.10	7.05	7.05
Horton	,,	11¼	—	13.45	14.30	15.55	17.10	16.25	14.30	15.30	15.05	14.25	—	14.45	17.10	15.50	16.00
Blea Moor	,,	17½	25	21.30	22.45	25.30	27.35	24.35	22.45	27.40	26.00	23.30	25	23.35	26.50	25.00	25.20
Dent	,,	22¼	—	26.55	28.00	31.40	34.25	29.45	28.30	34.30	32.20	29.50	—	29.30	33.15	31.15	31.35
Hawes Junction	,,	25½	—	30.00	31.30	35.00	38.05	32.45	31.35	37.55	35.35	33.15	—	32.40	36.40	34.40	34.55
Ais Gill ¶	arr.	28½	pass	33.15	34.35	38.20	41.45	35.50	34.45	pass	pass	pass	pass	pass	pass	pass	pass
(summit)	dep.	—	37	34.25	35.45	39.20	43.15	36.55	35.45	41.10	39.00	36.20	37	35.35	40.05	37.55	38.05
Kirkby Stephen	,,	35¼	—	43.25 *a*	44.05	47.40	51.50	44.55	44.00	47.25	45.05	43.15 *c*	—	43.50 *d*	46.50	44.40	44.10
Ormside	,,	43½	—	50.45	51.05	54.45	58.55	52.35	51.30	55.20	52.40	51.40	—	51.50	55.15	52.40	51.45
Appleby	arr.	46	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	56	54.40	58.40	55.45	54.45
	dep.	—	55	53.00	53.15	57.00	61.10	54.50	54.00	57.40	54.55	55.00	57	55.40	59.15	56.45	55.30
Culgaith	,,	53½	—	59.20	60.05	64.00	68.45	61.35	60.55	64.45	61.25	61.45	—	64.30	67.50	65.45	64.40
Lazonby	,,	61¼	—	65.55	67.30	71.05	76.15	68.30	68.10	72.00	68.10	67.55	—	71.05	74.35	73.00	71.55
Armathwaite	,,	66¾	—	71.00	73.40	76.55	82.05	73.50	73.50	77.45	73.10	72.45	—	76.05	79.40	78.20	77.35
Scotby	,,	74	—	77.55	81.05	83.55	89.15	80.40	*b*	84.15	79.40	78.50	—	82.25	86.05	85.05	84.20
Carlisle	arr.	76¾	86	82.30	85.00	87.45	92.35	85.10	89.45	88.55	84.10	83.25	89	87.00	90.45	89.00	88.05
Net times‡		76¾	86	81½	85	87¾	92½	85¼	85¼	89	84¼	81½	89	85½	90¾	89	88
Hellifield to Ais Gill	Time.	28½	37	33.15	34.35	38.20	41.45	35.50	34.45	41.10	39.00	36.20	37	35.35	40.05	37.55	38.05
	Av. speed m.p.h.		46¼	††51.0	††49.0	††44.2	††40.6	††47.3	††48.8	41.5	43.8	47.1	—	48.1	42.7	45.1	44.9
Settle Junction to Blea Moor	Time.	14	21	17.00	18.15	20.45	22.45	19.20	18.20	23.00	21.25	19.05	21	19.05	22.00	20.05	20.20
	Av. speed m.p.h.		40	49.4	46.0	40.5	36.9	43.4	45.8	36.5	39.2	44.0	—	44.0	38.2	41.8	41.3
Horton to Blea Moor	Time.	6	—	7.45	8.15	9.35	10.25	8.10	8.15	12.10	10.55	9.05	—	8.50	9.40	9.10	9.20
	Av. speed m.p.h.		—	46.4	43.6	37.6	34.6	44.1	43.6	29.6	33.0	39.6	—	40.8	37.2	39.3	38.6

§ 6 ft. 6 in. re-built. ‖ 6 ft. 6 in. early type. * 6 ft. 6 in. Belpaire re-built. † 7 ft. 0 in. re-built. *a* permanent way check—Mallerstang. *b* Signals, Cumwhinton, **2 min. dead stand.** *c* **Signal check, Ormside, severe.** *d* **Signal check, Mallerstang, severe.** ‡ **Excluding signal and permanent way delays only, not stops at Ais Gill or Appleby.** ¶ **The actual stopping point of trains detaching pilot engines is about ¼ mile south of Ais Gill Box, 28¼ miles from Hellifield, and 48¼ miles from Carlisle.** †† **Average start-to-stop, calculating on distance of 28¼ miles.**

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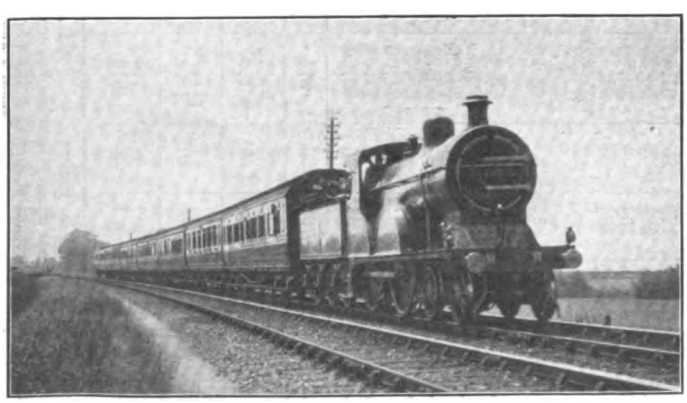
climb ; the actual minimum speeds reached on a climb of this length and continuity of grade are really of little value, being greatly dependent on the circumstances of the moment.

On the whole it cannot be denied that the uphill work was very good. It is worthy of special record that on only three occasions out of a total of 13 was the schedule allowance from Settle Junction to Blea Moor exceeded : two of these were frankly poor runs throughout (Nos. 7 and 11), but on the other run (No. 4) the exceptional load rendered this small loss of time excusable. At the same time the average work does not quite attain to present-day London and North Western standards, as recently described in these columns, the average of the speeds on unpiloted trains on the last portion of the climb being a trifle lower than the minimum speed of the superheater-hauled London and North Western expresses at the summit of Grayrigg bank. The latter ascent, though very nearly as long, is of course less steeply inclined, save for the final two miles at 1 in 100, but it must be remembered that speeds of 41·9 miles per hour have been sustained on the 1 in 100 length, with loads of 44 axles, or 305 tons, and a speed of 42·9 with 37 axles, or 265 tons, by 4–4–0 engines of the " George the Fifth " type. Against this the best Midland sustained speed with 36 axles, or 255 tons (run No. 9) was one of 39·6 miles per hour, although behind a 4–4–0 engine of roughly the same size and weight. With the new 4–6–0 engine *Sir Gilbert Claughton* I have actually recorded a sustained speed on the 1 in 100 of Grayrigg bank of 47·4 miles per hour with a 44-axle load, but that is a story of which the telling shall be postponed for a little while. I do not mean to infer that the Midland engines *could* not achieve equally good uphill times if they were " pushed " ; on the best runs shown time was, in most cases, in hand, so that undue effort was perhaps not necessary.

Of the unpiloted times up the incline, that of No. 995 in column 9 was by far the most noteworthy, the honours thus resting with a superheater engine. The load also was a very fair one, according to Midland standards ; indeed, it was a surprising thing to find the engine which hauled the heaviest unpiloted load making the best time. Curiously enough the same engine took an identical time with the much lighter load in column 10, whereas No. 993, with a slightly reduced load, needed a further 1¼ min. The work of No. 998 was poor on the first occasion, but improved somewhat on the second. An average speed of 49·4 miles per hour up an incline of 14 miles at 1 in 100 strikes the observer as something startling, but is no more startling than the provision of a pilot engine on a load of 28 axles, as shown in column 1. The first four runs are curiously conspicuous by the way in which the times rise and the speeds fall in exact progression with the increase of load in each case. Finally, it is well worthy of note that on 9 occasions out of 13 an average speed of over 40 miles per hour was maintained from Settle Junction to Blea Moor, while on 5 occasions out of 13, closely approached by another two or three, the sustained speed at the summit of the 1 in 100 was one of 40 miles per hour or over.



Photo] [*E. D. Ashton.*

MIDLAND RAILWAY.

10.45 a.m. Bristol-Edinburgh and Glasgow Restaurant Car Express. Rebuilt locomotive No. 501.

Greater difficulty was experienced in keeping the tight booking of 12 min. for the 11¼ miles from Blea Moor to Ais Gill summit, although these are not much harder than level. In the first place, the stretch is entered on at only a moderate speed, while also the conclusion of it is fairly steeply inclined upwards. Consequently 8 of the trains lost time between these two points, and 2 maintained it exactly, leaving only 3—Nos. 2, 3 and 5—which showed a fractional gain on schedule, in each

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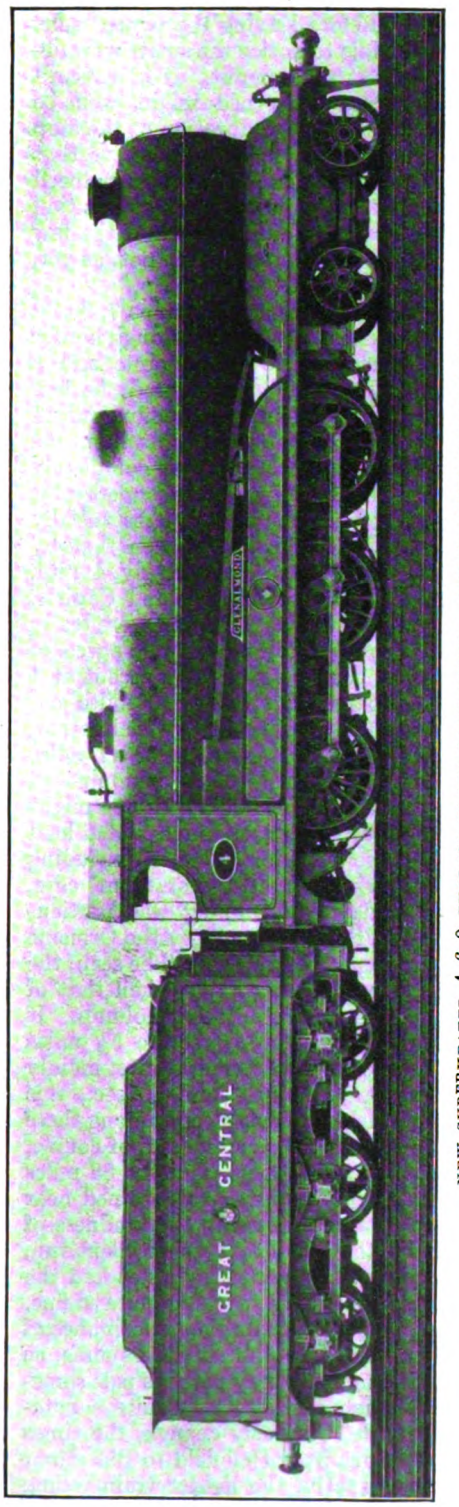

NEW SUPERHEATER 4–6–0 EXPRESS GOODS LOCOMOTIVE: GREAT CENTRAL RAILWAY.
Designed by Mr. J. G. Robinson, Chief Mechanical Engineer.
In general features the design is equivalent to the *Sir Sam Fay* class, but with 5 ft. 7 in. coupled wheels.

case from passing Blea Moor to a dead stand at Ais Gill. Coupling the almost impossible booked start with the difficult finish, therefore, there is on the whole a stiff proposition embodied in the 37-minute schedule from Hellifield to Ais Gill, involving as it does a continuous average of 46¼ miles per hour between these two points. Of the unpiloted engines, only the superheater 4–4–0 No. 995 contrived to keep time at all; No. 998 and the compound No. 1010 lost up to 2 min., while the unpiloted re-build No. 522 lost badly. Among the piloted runs the superheater again vanquished the compound (columns 6 and 5 respectively), although with identical loads and pilots, the superheater average of 49·2 miles per hour to the summit being very fine, showing as it did a gain of 2¼ min. on schedule.

It is not necessary to say so much of the downhill running, although that journey is much longer and more full of incident than the one by the London and North Western Railway from Shap summit to Carlisle. As in the latter case, the times are framed to allow of moderate speeds, and running is, on the whole, very moderate also. The fastest descent was that of the compound in column 8, which covered the 48½ miles from Ais Gill into Carlisle in 45 min. 10 sec., or the 45¾ miles to Scotby in 40 min. 40 sec., but at no point exceeded a maximum of 75 miles per hour. This time would probably have been beaten by the superheater No. 995 in run 9, however, but for the Ormside check. The times on the latter run beyond Appleby were, it will be noticed, considerably the faster, and a maximum speed of 83·3 miles per hour was maintained for some distance in the neighbourhood of Lazonby. It will be noticed that there is considerable diversity in the times taken to cover the final 2¾ miles from Scotby into Carlisle, ranging from 3 min. 20 sec. in the case of the train in column 4, which had lost a considerable amount of time, to 4 min. 40 sec. with the trains in columns 7 and 11. There was a certain amount of whistling for signals in several runs from Durran Hill Junction onwards, and perhaps some slight checks, but nothing in any instance for which it was worth making allowance in the net times. Consequently, by means of a smarter finish, the excellent times of certain runs might have been even further improved to the extent of a minute, or perhaps a trifle more.

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A few notes on individual runs will complete the review. Small though the load was in the first run for two engines, the time to the summit was really surprising, with its start-to-stop average of 51 miles per hour over a road with so mountainous an upward inclination. The downhill speeds were decidedly high, and the driver ran brilliantly over the up-grades in the neighbourhood of Armathwaite, but a still more pronounced gain on schedule time could have been achieved with ease by means of a faster approach to Carlisle, which might have brought the net time down nearly to 80 min. Maximum speeds were recorded of 73·8 miles per hour near Crosby Garrett, 83·3 past Lazonby, and 64·3 at Cumwhinton. Run No. 2 was also an excellent, although not particularly noteworthy, effort: its finest feature was the high speed maintained from Blea Moor to Ais Gill, which helped to raise the average from Hellifield to Ais Gill to as high a figure as 49 miles per hour. Against this run, No. 3, with but little greater load, seems a trifle poor. On No. 4 run the unusually heavy holiday load rendered time-keeping a matter of considerable difficulty, but it is worthy of note that the one engine, after passing the summit, contrived to keep time, or very nearly so, on into Carlisle. This involved some high speed at certain points, a maximum of 77·5 miles per hour being attained after Kirkby Stephen, while also, with such a load as 54 axles, the time of 5 min. 50 sec. from Lazonby to Armathwaite, was an excellent achievement.

The chief interest in runs 5 and 6 lies in the direct comparison which they afford between the work of a compound and a simple locomotive respectively, under practically identical conditions of load and of piloting. To a certain extent the compound run was marred by its unusually sluggish start, giving the simple engine 50 sec. advantage to Settle Junction, and a further minute to Blea Moor, but from this point the compound and its pilot ran exceptionally fast to Ais Gill—substantially faster than on any other trip—and so regained ¾ min. After detaching the pilots, the compound's downhill work was considerably the faster, as the times of No. 996 had been overtaken on passing Armathwaite, but this was by means of higher maximum speeds; the compound's top speed was 75 miles per hour near Ormside, whereas the simple's highest were 71·4 at both Ormside and Lazonby. It is probable that the times at the finish would have tied had it not been for the unfortunate stop at Cumwhinton on run No. 6. Before leaving the piloted runs it is worth while to notice the smart working of the pilots at the summit. It is a record of which those concerned might well be proud that the average duration of the stop to detach the pilot was only 69 sec., so that the time lost on this account was reduced to an absolute minimum. I might mention at this point that No. 996 is one of the few engines of the 999 class that has not, as yet, received a superheater.

Of the unpiloted runs in columns 7, 8 and 9, No. 7 was decidedly poor, although harder running at certain downhill points and a smarter finish might have reduced the loss of time. Neither was the compound run in the next column particularly brilliant as regards its uphill work, which is completely overshadowed by that of the superheater engine in column 9, with a substantially heavier load; but it will be seen that by very fast downhill running nearly 4 min. were gained between Ais Gill and Carlisle. The exploits of No. 995, however, were really brilliant. To maintain an average speed of 44 miles per hour over 14 miles ascent at 1 in 100, to barely fall below 40 miles per hour on the final 6 miles at this inclination, and to show an average of over 47 miles per hour from Hellifield to the summit—all these were feats of which the driver might justly be proud, with such an unpiloted load as nine bogie corridor vehicles, including two heavy eight-wheeled restaurant cars. Again, the downhill running was particularly brisk, although marred by the Ormside check: beyond Culgaith, as will be seen, the speed was considerably higher than that of the compound in the adjacent column. It was a wonderful feat to cover the 5½ miles between Lazonby and Armathwaite, mainly on adverse grades, in 4 min. 50 sec., this time constituting quite a record among these runs. So fast a time was secured, of course, by means of the impetus from the 83 miles per hour maximum that was obtained near Lazonby. I am indebted to the kindness of a friend for the details of this excellent run, and am only sorry that I have not had the opportunity of timing anything quite so fine.

After the foregoing run the performance of No. 995 on the 1.30 p.m. *ex*-St. Pancras, as shown in column 10, may perhaps pale somewhat, although this also was quite a noteworthy effort. Curiously enough, the times of the two runs from Hellifield to Blea Moor tie almost exactly, the lighter train telling to the extent of ¾ min. gain thence to the

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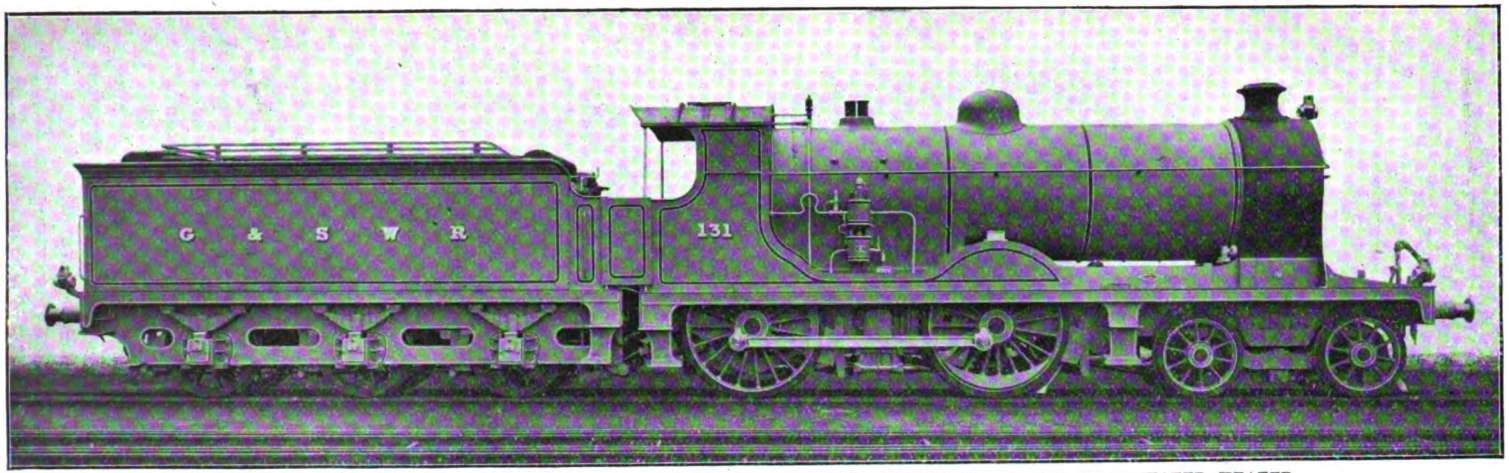
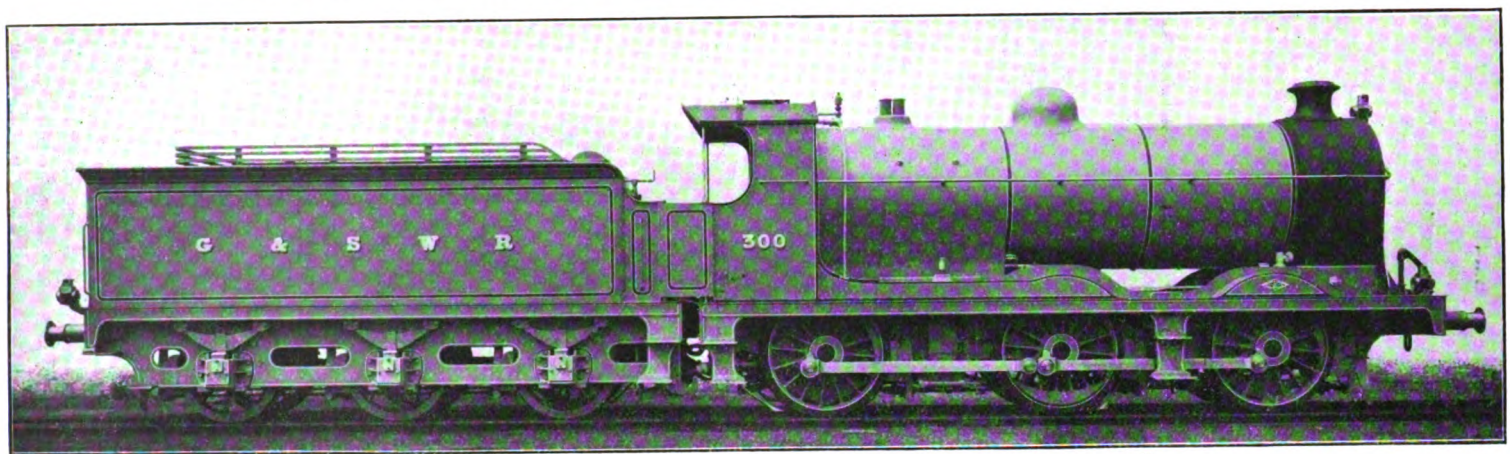


4–4–0 PASSENGER LOCOMOTIVE, WITH WALSCHAERT VALVE GEAR, STEAM DRYER AND FEED WATER HEATER.



0–6–0 GOODS LOCOMOTIVE, WITH STEAM DRYER AND FEED WATER HEATER.

Glasgow & South Western Railway: New locomotives designed by Mr. P. Drummond.

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summit. The maximum speed at Hawes Junction on run 10, indeed, was as high as 70·3 miles per hour, and the minimum at the summit itself as high as 57·7 miles per hour. After the Mallerstang check the running was studiously moderate, but a brisk effort was made beyond Appleby, a maximum speed of 77·5 miles per hour being reached at Lazonby. No. 998 afforded a rather dismal performance on the first run timed (No. 11), although in mitigation it may be stated that a very high wind made itself felt with considerable violence on the final stages of the ascent to Blea Moor. Even then, however, one is at a loss to understand the reason for running beyond the summit so abnormally cautious that time was barely kept thence to Appleby. Under the circumstances, also, the road being quite clear beyond Scotby, the short run from Appleby into Carlisle—the best feature of the whole run—might have been further improved by a smarter stop. In run No. 12, however, the work of No. 998 showed a decided improvement, although even then nothing more remarkable was accomplished than almost exact time-keeping throughout. Considering the load, No. 993's work on the last run was excellent, although not attaining to that of No. 995 in column 9. The running was particularly brisk from Ais Gill to Appleby, touching a maximum of 76·3 miles per hour before Kirkby Stephen, but, strangely enough, an unaccountably sluggish period set in after leaving Appleby. However, time was more than kept.

The short run behind No. 995 given in the July issue of the RAILWAY MAGAZINE forms part of a trip that I enjoyed on the second or Edinburgh portion of the 11.30 a.m. (winter) express from St. Pancras, which leaves Hellifield after the Glasgow portion, and makes additional calls at Kirkby Stephen and Appleby. On this occasion, as may be remembered, the load was light, consisting only of 25 axles, or 160 tons. We started moderately from Hellifield, in anticipation of running into the signals of the first portion of the train, taking 4¾ min. to Settle Junction and 6 min. 50 sec. to Settle: near the lime works our fears were realised, and a bad signal check took place, making our time to Horton 15¾ min. Worse was to befall, however, as at Blea Moor Box we were stopped dead at signals for 20 sec.; but our start-to-stop time from Hellifield, including the check, was one of 25 min. 20 sec., or only 20 sec. over the scheduled time to passing this point. Starting afresh from Blea Moor, Dent was passed in 8 min. 5 sec., Hawes Junction in 11 min. 35 sec., and Ais Gill in 14 min. 50 sec., the 18 miles from Blea Moor start to the conditional stop at Kirkby Stephen occupying 22 min. 20 sec. A further check, on this occasion for relaying, was encountered at Ormside, so that the 10¾ miles, almost entirely downhill, from Kirkby Stephen to Appleby required 13 min. from start to stop. With all these delays, therefore, we left Appleby 3 min. late, and then followed the lightning sprint that regained 2¼ min. of the arrears. I will recapitulate the details briefly. Culgaith was passed in 8½ min., Lazonby in 14 min. 40 sec., Armathwaite in 19½ min., and Scotby in 25 min. 50 sec., Carlisle being reached in 29¾ min. This, therefore, was a smart time for a 30¾ miles' run. No. 995 touched a maximum of 83·3 miles per hour near Lazonby on this occasion, and repeated the time previously obtained of 4 min. 50 sec. between Lazonby and Armathwaite.

Before leaving this subject, I wish to give details of an extraordinary record that was secured over this road by a Newcastle correspondent—Mr. W. C. H. Church—during the month of October, 1902. This gentleman enjoyed the close acquaintance of the late Mr. Charles Rous-Marten, and he is the fortunate possessor of logs dating back to the historic "Race to Aberdeen" of 1895, and beyond. So the figures to follow may be accepted as absolutely authentic, and were taken in careful detail at each mile-post. The train was the 9.30 a.m. *ex*-St. Pancras, the load "= 17½"—presumably 9 eight-wheelers and 2 twelve-wheeled dining cars, which would total 48 axles, and in weight about 320 tons—and the train engine throughout from Hellifield to Carlisle, No. 2607 (original numbering), of the 4–4–0 Johnson type, piloted to Ais Gill by a 2–4–0 engine, No. 237. With such a load the speed from Hellifield to Ais Gill was quite exceptional, as the time occupied on this stretch totalled only 37 min. 47 sec., and the average speed up the long incline appears to have averaged only a trifle less than 40 miles per hour. For some unknown reason the summit stop seems to have been made quite ¼ mile south of the usual point, or 28 miles from Hellifield, leaving a journey of 48¾ miles on to Carlisle. It was over this stretch that one of the most phenomenal speed efforts I have ever seen recorded in these islands was performed.

Starting away from mile-post 259½ after a stop lasting 1¼ min., post 261 was passed

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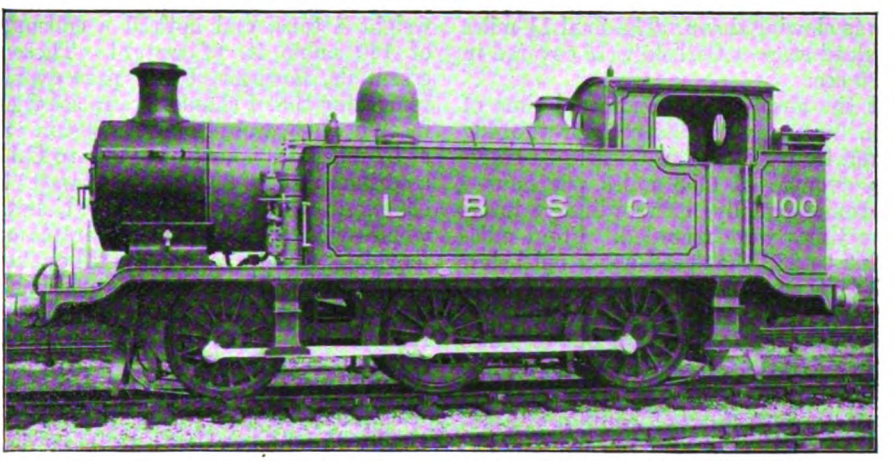
in 3 min. 6 sec.; thenceforward subsequent miles occupied 62, 54, 50, 47, and 45 sec. A speed of 80 miles per hour was therefore obtained before passing Kirkby Stephen (at 266¾ miles), which was cleared in 7 min. 57 sec. from the summit start. The mile on which Kirkby Stephen station stands occupied 44 sec. (81·8 miles per hour), as also the subsequent mile; the next 4 miles (posts 268-272) took 45 sec. each, after which followed an acceleration to 43 sec. between posts 272 and 273, and further to were taken, averaging 45⅓ sec. per mile. Appleby, situated at mile-post 277½, was passed in 1 min. 47 sec. from Ormside, and in 15 min. 44 sec. from Ais Gill. Speed still continued high from mile-post 279, subsequent miles taking 44, 44, 44½, 46½, 46 and 45 sec. to Culgaith (mile-post 285), passed in 5 min. 39 sec. from Appleby.

On the undulating stretch beyond this point a slightly lower speed was recorded, miles beyond Culgaith occupying 45, 48, 47, 47½, 46, and 46 sec. to mile-post 292; the



LONDON BRIGHTON AND SOUTH COAST RAILWAY: NEW 0–6–0 TANK ENGINE FOR LOCAL GOODS AND SHUNTING TRAFFIC.

Designed by Mr. L. Billinton, Locomotive Engineer.

These engines, classed as "E2," will supersede the older engines of the type known as "E1," which were built to the design of the late Mr. Stroudley, some of them dating back to the year 1874. The boiler, cylinders, and motion, are standard parts, and are duplicate with those of other classes of engines on the line. The valve gear is of the "Stephenson" link type, with "D" slide valves, the cylinders and valves being lubricated by a graphite lubricator. Feed water is heated in the side tanks by exhaust steam from the cylinders, and is delivered to the boiler by a "Weir" feed pump fixed on the front end of the left-hand tank. In addition, a combination injector of the hot water type by Davies and Metcalfe is fixed to the back of the firebox. The engine illustrated is at present stationed at Eastbourne.

The principal dimensions of the engines are as follows: Cylinders, 17½ in. diameter by 26 in. stroke; wheels, 4 ft. 6 in. diameter; working pressure, 170 lb. per sq. in.; heating surface—200 tubes 1¾ in. diameter 1,003 sq. ft., firebox 97 sq. ft., total 1,100 sq. ft.; grate area, 17·35 sq. ft.; tank capacity—water 1,090 gallons, coal 2½ tons; maximum length over buffers, 33 ft.; weight in full working order, 52 tons.

40 sec. (90 miles per hour) between posts 273 and 274. A time of 42 sec. was recorded for the next mile—finishing at Ormside station, which was passed in exactly 6 min. from Kirkby Stephen—and again of 40 sec. for the mile between posts 278 and 279, so that, allowing for the possibility of slight errors, it is evident that a maximum speed of 90 miles per hour must have been touched about this point. Speed fell slightly on the next three miles, with their slightly adverse grades, for which a total of 2 min. 16 sec. total time from Culgaith to Lazonby (post 292¾) was 5 min. 49½ sec., the mile on which Lazonby station stands taking 48 sec. The sharp 1 in 165 rise beyond Lazonby reduced the speed considerably, miles onward from post 293 consuming 51½, 56 (minimum speed 64·3 miles per hour), 55, 52, and 51 sec.; Armathwaite station, at post 298¼, was passed in 5 min. 29½ sec. from Lazonby, and this mile, to post 299, occupied 53 sec. On the further rise at 1 in 132 beyond Armathwaite comparatively low speeds were

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again recorded. The mile from post 299 to 300 took 54 sec., and the next mile 57 sec., this last reading of 63·2 miles per hour being the lowest recorded. Needless to say, however, the maintenance of such high minima was no less marvellous than the high speed running, considering the weight of the train. After this point speed rose rapidly on the final descent, miles from post 301 occupying 50, 48, 48, and 47 sec.; Scotby, at post 305½, was passed in 5 min. 44 sec. from Armathwaite, and 38 min. 26 sec. from the summit, this and the subsequent miles taking 52 and 59 sec. respectively, while the train was slowing down. The final 1¼ miles to the dead stop at Carlisle were covered in 2 min. 5 sec.

Thus the absolutely phenomenal time of 41 min. 55 sec. was obtained for the 48¾ miles run from Ais Gill to Carlisle—a start-to-stop average of 69·8 miles per hour—while some equally extraordinary intermediate times were recorded. From mile-posts 265 to 282 the speed never fell below 80 miles per hour, save for one brief ½ mile, this 17-mile distance occupying 12 min. 26½ sec., or averaging in speed all but 82 miles per hour. On the 30 miles from posts 263 to 293 the speed never fell below 72 miles per hour, and the time of 22 min. 34½ sec. yielded an average of 79·7 miles per hour; the time from posts 262 to 307—that is, from the attainment of the mile-a-minute rate to the conclusion of it—was one of 35 min. 32 sec., representing an average speed throughout of almost exactly 76 miles per hour. To compare this run with those tabulated affords a startling commentary on the change that has now taken place in the direction of faster uphill running and a much more moderate downhill gait. The total time on this extraordinary run was 80 min. 57 sec. from Hellifield to Carlisle, or really not so very great an improvement as one might expect on the net time of the superheater engine 995 in column 9. If only such exhibitions of downhill speed were added to modern uphill running, we should very soon have to scrap the present time tables!

A run such as the foregoing forms a fitting prelude to a few remarks on the "fastest train in the world," with which I will conclude the present article. Several friends have kindly forwarded to me at the time of writing cuttings of an article under this heading which recently adorned the pages of a leading halfpenny journal, asking whether the information therein purveyed were strictly accurate. After having, with some difficulty, extracted the small percentage of fact from its generous accompaniment of journalistic "padding," I concluded that the writer had been making a trip on the 9.55 a.m. express from Paris (Nord) to Calais, that the train weighed 392 tons and accommodated 300 passengers, and that the engine was of 1,800 horse-power, weighed 86 tons, and cost £5,000. Moreover, the gentleman was privileged to ride on the footplate, recorded the passage of 337 shovelfuls of coal from the tender to the firebox (each of the capacity of a drawing-room coalscuttle), totalling in weight 4 tons, and noticed a consumption of 140 cubic ft. of water! These non-essentials, however, I will pass over, only remarking that I should like to see the locomotive which would haul a 400-ton express at 57 miles per hour from Paris to Calais on a consumption of 892 gallons of water! The climax of the run was reached, however, when—with a sensation comparable on the footplate only to a "small earthquake"—a maximum speed of 75 miles per hour was maintained downhill for 10 min., thereby relieving the writer of any remaining doubt that this must be the "fastest train in the world."

Needless to say, such a conclusion is wholly ill-founded. The train in question covers the 185·4 miles from Paris to Calais Pier in 195 min., at an average speed of almost exactly 57 miles per hour. But the Northern Company of France have themselves other and much faster trains. On the Brussels service there is a booking of 93 min. for the 95¾ miles from Paris to St. Quentin, and others of 94 and 96 min. The train making the 93 min. run follows it up by covering the succeeding 53½ miles from St. Quentin to Erquelinnes in 55 min., so that the whole 149¼ miles from Paris to Erquelinnes are covered in 151 min., despite the intermediate stop of 3 min. duration. This is over a road as difficult as the English G.N.R., with long banks at 1 in 200. In the reverse direction the St. Quentin-Paris run is made in 97 min., while another very fast run is from Paris to Longneau, 78½ miles, in 79 min. In this country the nearest comparison to the French run described is, I suppose, the 3-hours service between Paddington and Exeter, averaging all but 58 miles per hour over a distance of 173¾ miles, with loads frequently reaching a total of 400 tons and over. I should be inclined to consider the English run the harder of the two: the gradients beyond

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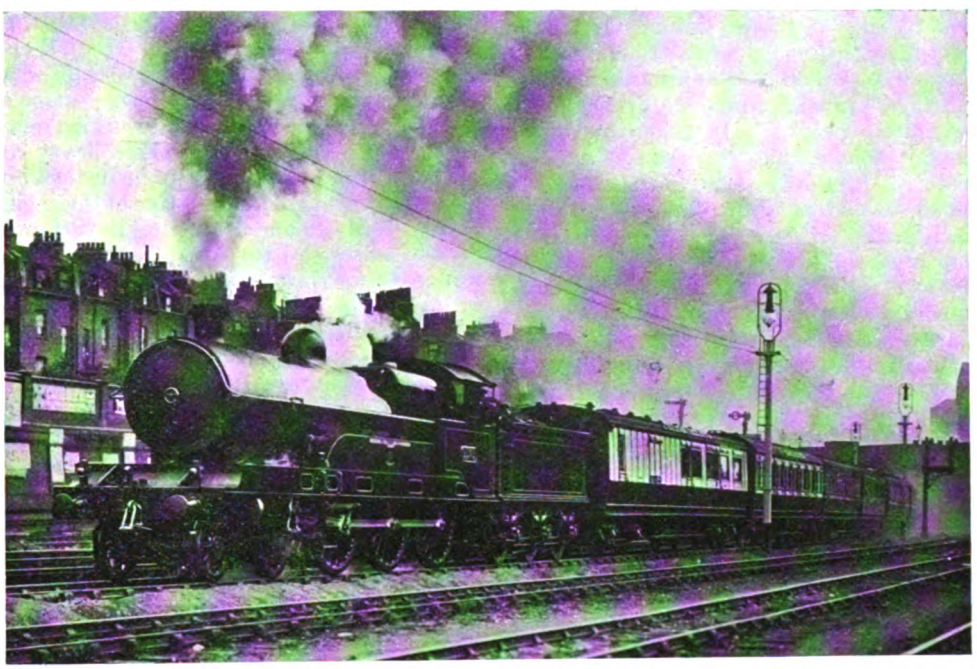
Reading are steeper than those of the Northern main line, while there are service slacks at Reading, Westbury and Frome to set against the one slack at Amiens in the other case. Beyond this there are, of course, many faster trains in this country and in France with more moderate average loads than the one mentioned—too numerous, indeed, to instance here.

As to the maximum speed of 75 miles per hour constituting a world's record, even if sustained for 10 min., such a statement is, of course, equally absurd. From the tenour of the article, I take it that this speed such speeds, although the latter was without doubt an exceptional occasion. Curiously enough, on the very day before I read this glowing effusion on speed, I had been treated to a magnificent speed exhibition on the Great Central Railway, with three maxima of 80 miles per hour and over, and one sustained length at 85. But of that I shall have more to say in the October issue. Again it will be remembered that, as recorded in these pages two months ago, the North Eastern 43-minute Darlington to York express recently was successful in covering 4 miles on the level at 80 miles per hour—a



Photo] [*F. E. Mackay.*

LONDON AND NORTH WESTERN RAILWAY.

12.10 p.m. Liverpool and Manchester Express leaving Euston.
New 4-6-0 four-cylinder (Schmidt superheater) locomotive No. 1191, *Sir Frank Ree.*

exhibition took place on the long descent from Survilliers to Creil—20 km. or about 12½ miles uniformly at 1 in 200 down—a speed of 75 miles per hour for 10 min. would thus exactly last the length of this bank. It is hardly necessary to remind readers that speeds up to and substantially exceeding 80 miles per hour are attained and maintained in this country daily on such grades, while maximum speeds of even 90 miles per hour and over are occasionally recorded. Such a run as that which concluded the Midland series in this issue affords ample evidence of much better claim to the title of the "world's fastest express" than a speed of 75 miles per hour down a 1 in 200 grade!

However, as pointed out at that time, the title of "the world's fastest express" unquestionably belongs to the summer train which is daily booked to cover the 55½ miles from Camden City, Philadelphia, U.S.A., to Atlantic City in 50 min., at an average speed of 66·6 miles per hour. I am indebted to my friend Mr. J. P. Pearson for details of the actual running of this express in August, 1912, which have been supplied to him by

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the Philadelphia and Reading Railroad authorities. During that month 27 runs were made, with an average time of 46¾ min. from start to stop, at an average speed of 71·2 miles per hour. Of these the quickest runs were one in 44½ min., and two actually in 44 min., at an average of 75·7 miles per hour. Out of the total of 27 runs, 26 were made in less than schedule time; on the other occasion the load amounted to no less than 495 English tons, and the time taken was exactly 50 min. The lightest load hauled on any trip was one of 376 tons; in both cases, of course, the weight of engine and tender was excluded. Such total times, of course, involve sustained speeds of well over 80 miles per hour throughout the run daily, more especially as the running at the Camden City end is complicated by level crossings, which must be traversed at moderate speeds. I understand from another source that the record time was made on July 20th, 1904, when the coast-bound train covered the distance in 43 min. dead, giving an average speed from start to stop of 77·4 miles per hour. The gradients favour this direction of running, but almost equally fast runs are made on the return journey when the road is clear.

Such times as these are certainly above anything we can show on our present schedules, and I am glad to be able to publish these details, in case my remarks in the July issue should have proved misleading. However, I am glad at the same time to add the dimensions of the standard "Atlantic" engines employed by the Philadelphia and Reading Company on this service, which render any comparison with British locomotive work somewhat valueless. The heating surface and grate area of these giants are both vast in quantity—3,270 sq. ft. and 94½ sq. ft. respectively—while the boiler pressure is no less than 235 lbs. per sq. in. In accordance with usual "Atlantic" practice, the cylinders are of more moderate dimensions, having a diameter of 22 in. and a stroke of 26 in., but one would imagine that they would be well supplied with steam at all speeds. Of the 93½ tons total weight of the engine, 49 tons are available for adhesion—a figure exceeding that enjoyed by even many 4–6–0 engines in this country.

The following particulars of new Glasgow and South Western Railway locomotives illustrated on page 193 may be given:—

The passenger engines, six in number, are somewhat similar to the large "Ben" class engines, introduced by Mr. Drummond on the Highland Railway a few years ago, They are intended mainly for working on the Glasgow-Greenock route, where heavy and smartly timed trains have to be worked over long and steep gradients. One of the engines is also used, we understand, on the Stranraer route, where also the road is hard and loads frequently heavy. A special feature is the use of Walschaert valve gear placed between the frames and operating piston valves, while the equipment also includes Mr. Dugald Drummond's steam dryer, duplex feed pump and feed water heater. The goods engines are generally similar design, except that ordinary link motion is used. There are fifteen engines of this class.

Dimensions are as follow:—

	4-4-0	0-6-0
Cylinders	19½in.x26in.	19½in.x26in.
Coupled wheels	6ft. 0in.	5ft. 0in.
Steam pressure	180lb	180lb.
Heat, surface—tubes (sq. ft.)	1,736·45	1,637·4
,, firebox (sq. ft.)	148·3	147·6
,, total (sq. ft.)	1,884·75	1,785
Grate area (sq. ft.)	28	26

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Photo] [*H. W. Hammond.*

A "T.O.T." COMBINATION—TRAIN (LONDON ELECTRIC RAILWAY), OMNIBUS AND TRAM.

Outside Golder's Green Station: A centre for underground electric, motor-omnibus and electric tramway services in conjunction.

Co-Ordination of Transport Facilities in London.

NOT many years ago the gospel of competition was widely preached, and it was considered almost inconceivable that combination and co-operation between agencies which were in any way in rivalry could mean anything else than private profit at the expense of the general public. That idea is now abandoned, and we find not only co-operation and combination between railway companies, but also similar working together between railway, tramway, and omnibus companies, in ways which operate strongly to the benefit of the general traveller, as well as profiting the companies concerned. This is, indeed, inevitable where various travel agencies are co-ordinated less with a view to removing competition than to open up further travel possibilities which shall justify necessities by the traffic which is created.

Several examples of this situation might be cited, but the most remarkable is undoubtedly the great system of electric railways, tramways and motor-omnibus services now under the control of the Underground Electric Railways Company. Here, with a combined system covering over 80 miles of electric railways and about 130 stations, about 100 miles of electric tramway, and omnibus services calling for almost 4,000 vehicles and covering the vast area of Greater London, with extensions in all directions beyond the boundaries, it follows that enormous travel possibilities are available. Moreover, the Metropolitan Railway and other lines are also to some extent associated with the Underground Electric Railways' lines and services, so that the traveller obtains full benefit of every conceivable development. A list of interchange stations where Underground electric lines are concerned is a formidable one. Virtually one can travel from "anywhere to anywhere" throughout London and the suburbs by using the Underground railways as one or more links in the chain of communication. Of the great termini, Fenchurch Street is the only one not directly connected, and there only a few minutes walk is entailed. At Charing Cross only two of the three underground lines are at present in direct communication, but when the loop extension of the Hampstead line is completed this drawback will be overcome, and Holborn and British Museum stations will then supply the only instance of incomplete underground connections. Moreover, escalators,

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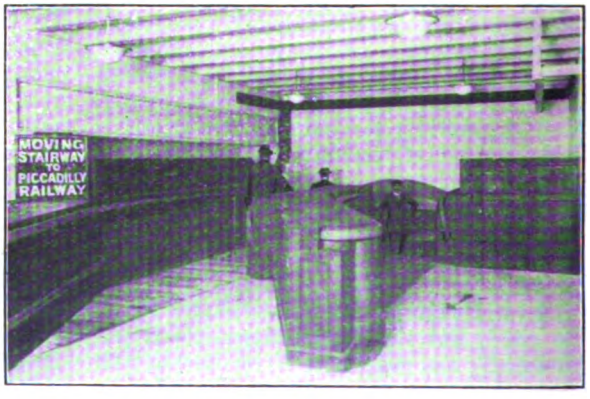
WARREN WOOD HOUSE, EPPING FOREST.

London General Omnibuses 16 miles from their town terminus. As in the old coaching days the country inns form suitable termini for modern motor road vehicle services.

underground subways and other conveniences have largely overcome what drawbacks there may have been as regards interchange facilities.

It is, however, in conjunction with electric tramway and motor omnibus services that co-ordination of facilities is most noticeable. Ever since the underground railways combined to form what is distinctively styled the UNDERGROUND, interchange, through booking and like facilities have been more or less general. But now all agencies work in conjunction, in many cases with through bookings covering road travel as well as transportation underground or by railway. Moreover, great and almost unthought of developments have followed this association of agencies, and yet, while a degree of competition with many railways is inevitable, the general result is rather to amplify London's transport facilities in ways which form a strong inducement to travel which would not otherwise exist. Thus we find that on Sundays, at holiday periods, and on early closing and Saturday afternoons, a great variety of special and attractive routes are available, while at ordinary periods the programme is of a notable, though less ambitious character, designed more to meet the usual transportation requirements of the districts concerned.

The Metropolitan District and associated railways gives a wide selection of day, half-day and special facilities over the country lines and extensions. At Richmond, Hammersmith, Shepherd's Bush and Wimbledon the London United Tramways services are in direct connection for journeys to Hampton Court, Uxbridge, and Teddington. The Metropolitan Electric Tramways constitute in effect similar extensions from Finsbury Park, Highgate, Hampstead, Paddington and Acton to Waltham Cross, Enfield, High Barnet and Canons Park (Stanmore), serving also intermediate districts. And as regards the London General Omnibus and other motor omnibus services, there is a very formidable list of routes. Week-day services go as far afield as Barking, Romford, Wanstead, Buckhurst Hill, Walthamstow,



ESCALATOR AT EARL'S COURT.

A modern convenience facilitating interchange traffic between the Metropolitan District and London Electric Railways.

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St. Albans, Watford, Windsor, Maidenhead, Esher, Surbiton, Croydon, Crystal Palace, Farnborough, Sidcup and Plumstead, besides others which still provide long and interesting journeys, though not quite so far out. On Sundays and at holiday periods some of these are extended to Epping Town, Chingford, Lambourne End, Rippleside, Cockfosters, Hatfield, Burnham Beeches, Virginia Water, Epsom, Whyteleafe, and Redhill.

In every case the omnibus route either starts from or runs in connection with an "Underground" station, operated directly or indirectly in conjunction with trains. Few pass through the heart of London, but they can be easily reached by a short journey by "Tube" or "District" train. Fares are very reasonable, frequently representing only a few pence each way, though many miles of travel through picturesque suburban and country districts may be entailed. Some of these trips are suited for day outings, half-day excursions on early closing days, while others provide a pleasant way of spending a fine evening, and others again are good for just the ride, which some folk love. Altogether, the combination of travel agencies thus afforded constitutes what is, perhaps, the most wonderful instance of what may be done by co-ordination of facilities in the public interest, and as such no one can deny that London as a whole has benefited greatly by the association of the various systems of transport.

TWO new posters issued by Mr. Alfred Aslett to advertise the beauties of Lake District resorts served by the Furness Railway are here reproduced. The originals, in colour, are effective and distinctive, even in these days of general artistic excellence in railway pictorial posters. Both depict familiar scenes in Lakeland. One shows a Furness Railway steamer and a boating party on Lake Windermere, with a magnificent scenic background. The other has a wider aspect, with a lady artist in the foreground transferring to canvas her impressions of the natural beauties before her. A footnote directs attention to the 20 combined rail, coach, and steam yacht tours arranged by the Furness Railway Company, and the Fleetwood and Barrow services of its steamers *Lady Moyra* and *Lady Evelyn*.

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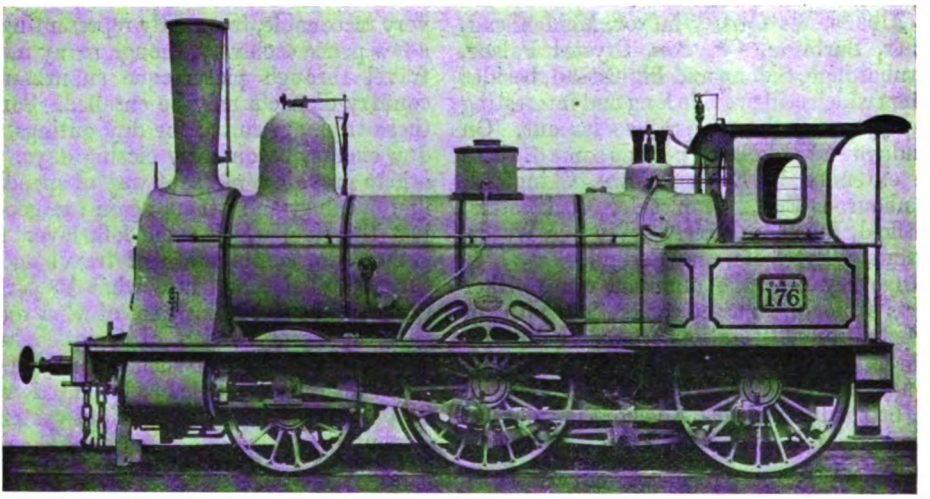

2–4–0 LOCOMOTIVE, BUILT BY MESSRS. KITSON & CO. FOR THE ODESSA RAILWAY IN 1872.

Some of the details of the above are noteworthy, such as the ingenious device on the Salter spring balance safety valve as a corrective to the short safety valve levers. Also the provision of coned flanged apertures near the clack boxes and on the sides and roof of the outer shell of the firebox, for the more effectual and easy removal of dirt.

Leaves from the Log of a Locomotive Engineer [No. XII.].

By ROBERT WEATHERBURN.

I SHALL not describe the various interesting and amusing incidents on my journey from Riga to Odessa. It was now autumn. I simply stayed for some hours at Kieff, the holy city of Russia, romantically situated, with its wonderfully frescoed monasteries, the bones of its hundreds of saints and martyrs, the abject devotion of the thousands who frequent its shrines and altars, its cucumber market, and myriads of pigeons—not forgetting its filth and cholera. Through Smerinka and Balta, on the fertile plains of Cherson, at length we arrive at Odessa.

Odessa is the great grain emporium of South Russia, possessing a mixed population of all countries, but few English. So important a part did it play in the Crimean War that it was subjected to a bombardment by the combined fleets of England and France. The pompous accounts published in this country led the public, myself among the number, to believe it to have been a brilliant affair. But I was credibly informed by gentlemen of unimpeachable authority that the damage inflicted was exceedingly little, and that the whole affair was almost a fiasco. On the Marine Boulevard, the most imposing promenade in Russia, close by the statue erected to Count Richelieu of Odessa fame, is shown a cannon-ball, the sole relic of the bombardment! Not so elsewhere. In one of the most public places are shown two English cannon captured from H.B.M. Ship *Tiger*. A long account is placed on either side of the gun-carriages, giving the particulars of that daring and brilliant exploit. In the cemetery near to the grave of one of my unfortunate colleagues, whom we buried there of cholera, lies the body of Captain Giffard, the hero who commanded the *Tiger*. Poor fellow, he had both legs shot off, and was carried through the streets alive with the torniquets on, but was afterwards buried with military honours by the Russians. In nearly every tea house and traktir are engravings to be seen, showing the encounter, which certainly appears very brilliant on the part of the

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Cossacks. I may further say that the Emperor's yacht the *Tiger* (named after the English vessel), which conveyed His Majesty Alexander III. to the Crimea every year, was driven by the engines of the British war frigate!

The town of Odessa possesses some of the best streets in Europe, the houses in many are very imposing, but being built of a soft friable stone, give early signs of decay. Some of the most beautiful mansions are already in a semi-ruinous condition. Looking towards the road leading to Odessa, one can discern long queues of bullock wagons, slowly and wearily making their way Odessawards. On one occasion, I counted 400 in one line, all laden with corn from the bountiful Chersonese. Not far from here is the tomb of Howard, the prison philanthropist. While residing in Odessa and supplying engines for the Odessa railway, I was solicited to allow the youths of the Polytechnic School to come through the old arsenal (which I had converted into shops), to see the engines in course of erection. In return, I paid them a visit in their workroom. The Polytechnic Institution was formed for the purpose of training the poor and deserving boys of the Russian town, and, indeed, in my estimation, formed one of the most pleasing and interesting sights there. Small lathes, drilling machines, smiths' hearths and vices were fitted up, and the room was a complete workshop. Diagrams of various articles in course of construction adorned the walls. Various pieces of forgings in different stages of progress were labelled—firstly, showing the class of iron the youthful smith should select; secondly, how to work it into its first stage; thirdly, finished from the anvil; and so on through all its stages until a finished one turned, fitted, and polished, formed the climax. They were under the training of a first-class German mechanic, and afforded a striking instance of the endeavours of the Russian Government to render the country independent of foreign aid.

Although there are brilliant exceptions to be found in Russia, as a rule the official classes, and the machinery of Government of which they are a part, move with perplexing slowness, which, to the energetic stranger desirous of making the most of the brief summer, is harassing to a degree. From north to south, from the shores of the Baltic to the distant Euxine, individual enterprise is shackled and toned down by something more than forms and customs. Occasionally, an official high in office, imbued with notions picked up from more progressive countries, will show a surprising and gratifying amount of spirit and enterprise, and such men at times possess the power of infusing a wonderful degree of vitality into their more ignorant and unthinking subordinates. But officialism, in a hundred different forms, demands its toll of time and something more, and the dead beaten rut gains the day.

Odessa harbour was well provided with floating cranes or derricks, capable of lifting loads up to 30 tons and 80 tons. These were at the time floated to the ships in the mole, which required their help to unload into barges. The four-wheeled coupled engines for the Odessa and Balta Railway had to be unloaded, and, to our chagrin and delay, this work had to be done by the Russian Government. The operation consisted in moving one of the powerful lofty jibbed steam derricks alongside the ship. The engines were then lifted out, placed in barges, and then towed some distance to the low-lying shore, where the railway led to the old arsenal, in which the engines had to be erected. But, unfortunately, this part of the shore outside the mole, was subject to a strong surf when the wind was in a particular quarter. The surf prevented unloading by the floating cranes, and so it happened that we had the mortification day by day to see the barges containing the boilers with frames and cylinders complete, rocking at anchor a stone's throw from the shore, the floating derricks tossing and swaying their high head gear in a most alarming fashion, which seemed to render all attempts at unloading impossible. This wind, like some of our easterly ones, continues at times for weeks. Thus it was, that day after day, with all else favourable, we were eating our hearts out to be at work and get finished, as we were much behind in delivery.

The Government Stevedore was an able man, experienced in the management of floating derricks and all unloading, but a slave to routine and adverse to any new departure. It was in vain that I urged him to find a more sheltered position for unloading. His answer was always, "Not possible." Immediately, on waking in the early morning, I sprang to the window to ascertain how the wind was, and so sure were we disappointed as we saw the tall jibs rocking to and fro on the waters of the bay. At last,

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in desperation, I offered the Stevedore ten roubles for every boiler with frames that he could unload, assuring him that by steadying the heavier lifts by means of guys and hand ropes, it might be feasible to unload. My arguments were strongly assisted by the fact that more than a dozen barges were already occupied with engines, and that, should other cargoes arrive, considerable delays to the ships would ensue. Very unwillingly he promised that a trial should be made the following morning (Sunday) if the wind did not increase

Weather was neither better nor worse when the time came. Steam was raised in the derricks, and with much fendering, lashing and shouting, a barge containing the boiler, frames and cylinders all in one, was secured to the side of the floating derrick, one yawing against the other, the huge and lofty derrick, cutting every figure possible, the huge iron blocks, although close reeved, swinging and pendulising in a most dangerous fashion. These were at last lowered, with plenty of "slack," to prevent the pounding blows they would otherwise have delivered with the 10 ft. and 15 ft. alternate rise and fall of the jib. Having secured them to the sling chain around the boiler, we arranged that the quick-speed lifting gear should be applied at the first deflection of the jib, with strong injunctions to the man at the engine to keep hauling when once clear of the deck, until the swinging load was high enough to prevent its striking the deck of the barge at the next dip of the jib. The action was well timed, and the slack was rapidly hauled in as the jib careered downwards, and before the reaction took place the boiler with frames was a foot from the deck of the barge. It was extremely fortunate that the man at the steam derrick was self-possessed and kept hoisting, for when the position of the derrick caught the next swell and heeled over on the opposite quarter, the huge mass was lifted in a moment's time at least 20 ft. from the deck, and had he not kept lifting at full speed, it would on the return dip have smashed the barge in pieces.

The barge was quickly hauled away, but the movements of the huge mass swinging in the air now became truly alarming. With much vociferation and excitement, the derrick was hauled into the shore until its jib projected at least 20 ft. over the roadway. Long ropes had, by my instructions, been attached to the frames previous to the lifting, so that we could haul in the surging load to steady its swinging and gyrations, the ends being used to take a turn round the buffers on some neighbouring 20-ton wagons in the sidings. Meanwhile, the upward and downward movements had become intensified and completely out of control by the pendulous movements, caused by the rolling of the pontoon. Let the reader imagine the movement of a 50 ft. iron jib mounted on a pontoon which was pitching and rolling so that every foot of movement of the pontoon was intensified double and treble at the mast head. To lower was the difficulty, as the rise and fall of the load, in the most capricious fashion, sometimes to the right, again swinging to the left, set all our means of steadying at defiance. More men were got together and extra ropes attached to those already in use for steadying purposes, and the load was lowered as nearly as possible without striking the earth. The extra ropes had now given us some little control over the pendulising movement above, and it had been arranged that the man at the steam winch should lower rapidly at the next lowest dip when the signal was given. At least 20 men were bowsing on one of the ropes, which had a turn round one of the wagons across one set of rails intervening between the wagon and the quay side.

At this unfortunate moment, an engine which had been shunting about for some time in the neighbourhood, well clear of everything, by some unaccountable stupidity or misunderstanding, came along the intervening rails and caught the rope. The men, scared, let go; the boiler and frames, released from the steadying strain, swung back towards the derrick well out of the way, but on the return movement, true and unerring as a huge battering ram, struck the awning of the locomotive, ripped it off like paper, and swinging round knocked off the safety valves, part of which went high up in the air with a sound like an explosion. The pent-up steam and water rose like a cloud, and, descending, enveloped us all.

Anxious to know what injury had been done to the men, I peered under the wagons and found the greater number had crawled under where they were assiduously crossing themselves and muttering prayers for help. It was indeed fortunate that the shunting engine had way upon it to carry it clear of further attacks, or it would have received more damage. As it was, the driver lost

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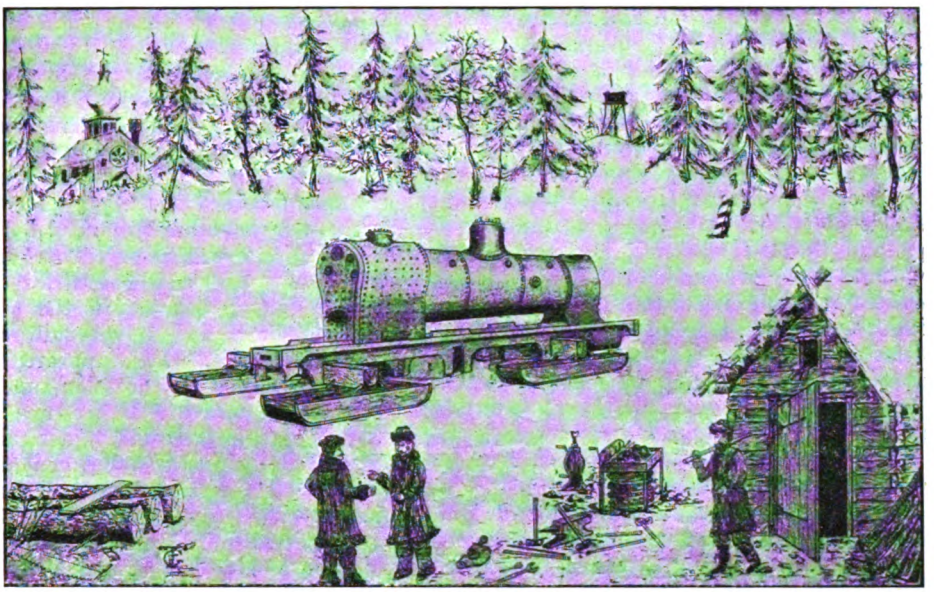

TRANSPORTING A LOCOMOTIVE OVER THE ICE.

This illustration is from a specially prepared drawing, showing the arrangement of through beams and sledges, devised by Mr. Robert Weatherburn, the auther of these articles, for transporting boilers with frames and cylinders complete across the river Volga, to the terminus of the Jaroslav, Vologda, and Archangel Railway. The water of the river having fallen after the surface had been frozen caused the ice to become deflected towards the middle, leaving the sides hollow and insecure, as was proved by trial holes. The ordinary single sledge employed on the roads was discarded as being too small in area for the 12 tons carried. Hence the arrangement of transverse beams—wood—through the leading and trailing horns, the ends of each resting on a separate sledge, made to slightly articulate at the bearings—in order to cover the maximum area of ice. The banks leading down to the river being 16 to 18 ft. above ice level had to be considered, hence the half-round bearing allowance on beams. The river varies from half to one mile in breadth. The drawing was made from pencil sketches of boiler frames, etc., on sledges taken from the writer's note-book, with description of locality prior to launching, by Mr. G. F. Tyas, to whom Mr. Weatherburn is much indebted.

his right hand. Gathering the men together, and once more restoring order, we got the suspended load safely to earth, but much damaged. The frames were bulged in at least two inches, and the boiler damaged close to the middle and end section. This was the first and last attempt made; and, strange to relate, although the wind had been adverse for more than a fortnight, the day following the accident we had a change, with the sea as calm as a fish-pond. One of the principal boulevards in Odessa is connected with the low-lying shore by as fine and imposing a flight of steps as are to be found anywhere, and these on the day in question, were crowded with sight-seers, whose interest was as speedily changed into consternation and flight when the explosion took place.

Leaving Odessa after a trying six months' experience, I gladly shook the dust off my feet, and took train for Cracow in Austria, thence to Warsaw. The journey was toilsome and protracted, but full of interest. Warsaw, the capital of unfortunate Poland, is a noble city, and of undying memory to the historical student—its splendid bridges, powerful fortifications, the latter completely holding the city at their mercy, and its palace of the old Polish king, depleted of its national pictures and regalia, which are now in Moscow. Erected in the centre of the city stands the finest monument in the whole of Poland, in memory of the heroic John Sobieski, the saviour of Europe, who raised the siege of Vienna, and drove back the all-conquering and then powerful Moslem. How has the noble deed been requited? The country he loved so well was ruthlessly conquered and partitioned by those whom he had saved. The splendid bridge, one of the finest in Europe, is so constructed that the Russians can blow it up at a moment's notice should

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the town successfully revolt, and thus sever one half of the town from the other.

The gallant Poles, for hundreds of years, the bulwark of defence for Western Europe against invasion, are hopelessly subdued. Nevertheless, the fires of independence still smoulder and burn in secret, though the hundreds of cannon that face the city, the thousands of troops escheloned, its mined bridge and floating batteries, all bespeak the volcano that can be made to belch forth and destroy the fair city of the Poles. After staying a few days, I submitted my passport for examination, and proceeded to Wilna and Kovno. Again, we entered on the broad path traversed by the Grande Armeé of France on its invasion and retreat, and after some tedious and uncomfortable travelling arrived in Riga, and went thence to Revel, a strange old town. Here the soft musical Russian gives way to the Esthonian and German tongues. Revel is the capital of Esthonia. It was fought for by all the northern powers, and was at last permanently conquered by the Great Peter. It was formerly a rendezvous for the Russian fleet, and the harbour is heavily defended. On my arrival I found an epidemic of smallpox raging, although it was winter, and I was vaccinated for the third time. Whatever doubts may exist in the minds of Englishmen regarding the efficacy of vaccination, I must say that the Russians have implicit faith in it.

Whilst in Odessa I saw workmen vaccinated wholesale at the gates of the factories and workshops by order of an imperial ukase. The operation is generally performed by the barber, who in that country undertakes many operations here allowed only to the medical profession. They simply draw a razor or sharp knife downwards and across, the upper part of the arm, thus forming a small cross, and then introduce the vaccine. From what I could see and gather, Revel had been a place of luxury and power, disputing the palm of importance with Riga. According to an old record, there were in ancient times many churches and plenty of good things, and it was an old saying that formerly Revel was an Elysium for the nobility, a haven for the clergy, a mine of gold for the merchant, and a hell for the peasant." This condition I can partly vouch for as being correct in some parts of Russia even now. One piece of sculpture struck me as being very peculiar—a niche, occupied by a skeleton, a toad resting on the body, a serpent crawling out of the ear.

In the Rosen chapel, an ancient edifice, lies the Duke of Croy, unburied. He formerly commanded the army of Peter the Great and was defeated by Charles XII. Knowing the violent temper of his master, he dared not return, and giving himself up to Charles, was sent to Revel, where he lived in extravagance and became bankrupt. By an ancient law of Revel, a bankrupt was denied the rites of sepulture, and so it was with the unfortunate duke, whose dried up body was found, I believe, in the year 1819, clothed in a fine velvet suit, silk stockings, a full wig, which appeared to have been curled for the occasion, and a lace collar of the period. The features are small and regular, and the old verger takes the corpse tenderly by the hand, generally remarking on leaving him, "There lies my best friend." Well may he say so, for the old attendant realises a handsome sum by the exhibition of his "best friend."

I also visited the mausoleum of Admiral Greig—one of the most renowned commanders of the Russian fleet, a Scotchman by birth—and leaving Revel made my way to Moscow by way of St. Petersburg. I passed a few days in that city of palaces, visiting the Winter Palace and the Hermitage, which contains the finest collection of antiquities and paintings in the world. Here may be seen Lapis-lazuli fountains and malachite ornaments of great size. In the small rooms of the Hermitage, amidst arms of the ancient Czars, I observed Peter's iron walking-stick, which had dealt many a fatal blow. It would have served the purpose of a crowbar much better than a stick. Amidst thousands of curios, was the musical and magical secretaire, which, it is said, opens spontaneously in many different directions at the sound of music. It would be impossible to give an account of the wonderful exhibits. The room of Peter is sufficient for a week's careful study. Among other things are the Arabian horse, which Peter rode at the crowning fight of Pultowa, now stuffed, and two dogs which were ever in his company. But the sight which arouses morbid interest in the visitor is the flayed skin of his private attendant, the sight of which, to me, was repulsive.

On arrival at "Moscow the beautiful," its churches glittered us a welcome when far off, as also did the towers of the Kremli n of various colours, pointed with gold. The latter is surrounded by an embattled wall and numerous turrets and gateways, the most remarkable of which is the "Spass Varota,"

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or the gate of the Redeemer. This is the sacred gate of Moscow. Through it entered all the conquering kings and Czars of Russia, and over the gate is a picture of the Saviour, before which hangs a large lamp always burning. Candles are sold at the gate, which you can have placed before the picture. Whoever passes through this sacred gate must doff his hat, let him be English, French or Mahometan, or failing this, on a repetition thereof, he will most assuredly see the inside of a Russian guard house. Many are the miracles reputed to have been performed here. The emperors always uncover when passing through its portals. No dogs are allowed to enter. These traditions are Scripture to the orthodox Russian.

The " Granovitaya," the Coronation Hall of the Czars, with its splendid velvet hangings, embroidered with gold and eagles, filled me with admiration. After a coronation and the feast, the room is untrodden by the Imperial family and Emperor until death claims him for his own. The " Malor Dvoretz," or little palace built by Nicholas, is not so pretentious. Polish eagles are shown, and many other trophies of that unfortunate land. Churches in Moscow number 1,300. All glitter with silver and gold and precious stones. There is a Greek Bible to be seen in the Church of the archangel Michael, which was the gift of the mother of Peter. It is covered with precious stones, and the binding is reputed to have cost 1,000,000 roubles. A nail from the true cross, and a robe of our Saviour's is here shown.

In the treasury of the Kremlin is to be seen the charter of the constitution of ancient Poland, and there is a beautiful arrangement of the crowns conquered by Russia. The crown of Poland is of polished gold, surmounted by a cross. The sceptre of Poland is a long greenish stone set in gold at the ends and broken in the middle —the emblem of its country, broken and severed. The cannon captured from the French were objects of great interest, 900 in number. Near at hand was a peculiar shaped tower, and, on a massive pedestal of stone, the mighty bell, whose fame has rung through the whole world. It was cast in 1730. The tower in which it hung was burnt, and the bell in falling had a piece broken from it, 6 ft. high, and 3 ft. thick. The height of the bell is 21 ft., and its diameter 22 ft. The thinnest part is 3 in. thick, and its weight is between 300,000 and 400,000 pounds. If it were copper alone, its worth has been estimated at £17,500 sterling. In the tower of Ivan the Terrible, among many bells of different sizes, is one of 64 tons; in fact, a bell madness seems to possess Holy Russia.

We remained long, searching, gaping and wondering. We strolled and climbed, and stared until the mind became almost bewildered. Gold looked like brass, and diamonds like glass, and the barbaric splendour of a pseudo civilisation palled upon our senses. A mighty intermingling of gold, diamonds and relics, barbarism and religion, big bells, gilded roofs, costly palaces, and the spoils of conquered nations, and through the whole there runs the bar sinister of blood. Thence we travelled to the distant banks of the Volga, chief river of Europe. Ours we felt to be a better mission than despoiling provinces. The distant iron track—the Jaroslav and Vologda Railway —was completed miles away—ours the task to put thereon the snorting warhorse of modern times, the locomotive. We bound the monsters on the prepared sledges, for the railway had ended there, and by the help of the strong arms of the peasantry, dragged them over highway and byway for many miles, then hauled the fettered monsters over the frozen bosom of the mighty Volga, up the steep banks, planting them firmly and fairly on the congenial track (see drawing on page 205). And how accomplished, I blush to say, for the Russian character is strongly leavened by a love of drink? Hear it, however, and anathematise, ye sturdy supporters of the Permissive Bill, for it was done by Wodka, Natchai, and brute force, the true stimulus of Russia, wielded and directed by Englishmen! After its completion, we returned to Moscow, taking another short glimpse at its marvels and treasures, ere we returned to the northern shores of the Baltic. We left it in wonderment, to moralise on its wealth, pomp and luxury within, its penury and starvation without. Inside, gold, jewels fruits and confections; outside, black bread cucumbers and salt. Inside, palatial palaces, outside, mud hovels.

Mr. Weatherburn's next Contribution will appear in the October issue of the " Railway Magazine."

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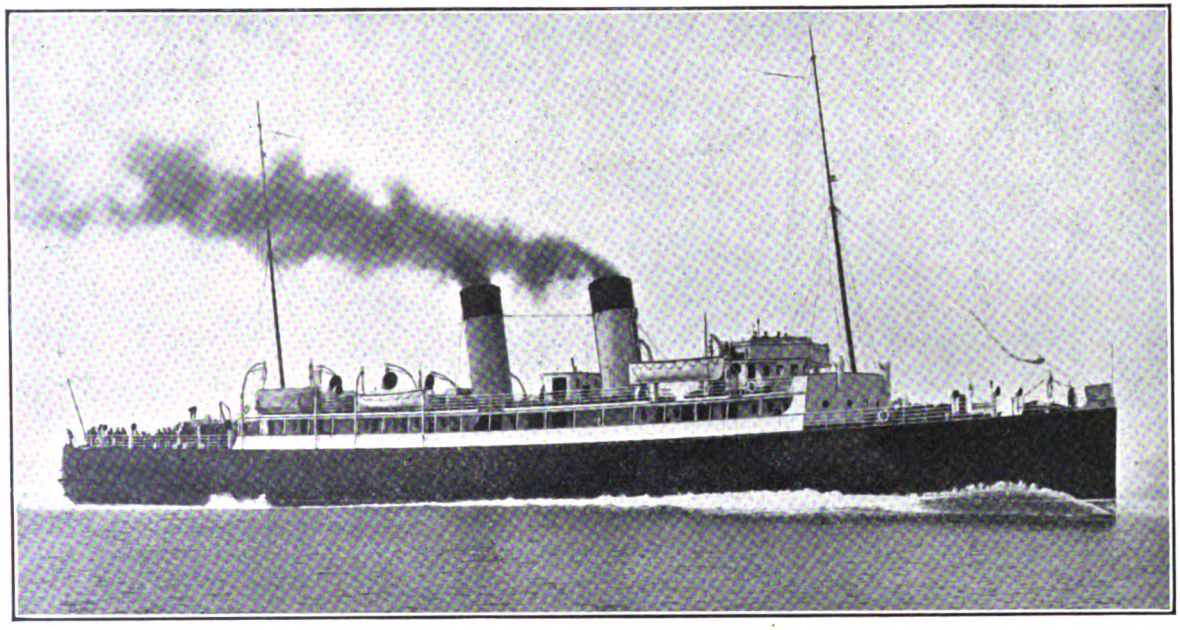
New 25-knot Geared-Turbine Steamer "Paris": London, Brighton and South Coast Railway.



This vessel, built by Messrs. Denny Brothers, of Dumbarton, to the order of the London, Brighton and South Coast Railway Company, is now engaged in the accelerated Continental services *viâ* Newhaven and Dieppe. Length between perpendiculars is 300 ft. 6 in., and moulded breadth and depth are respectively 35 ft. 6 in. and 23 ft. 3 in. The propelling machinery consists of two independent sets of Parsons' compound steam turbines, each set driving a single shaft. Yarrow water-tube boilers are installed, and a new system of thrust block is employed. Accommodation for 968 passengers is provided, and with a speed of 25 knots, the *Paris* will make the passage between Newhaven and Dieppe in 2¾ hours. This acceleration, in conjunction with the adoption of the shorter route to Paris *viâ* Pontoise, and "speeding up" on the French side, enables the journey between London and Paris to be made in 8 hours. The *Paris* is splendidly equipped, with special accommodation for motor-car traffic, a bathroom, wireless telegraphic outfit, and efficient steam heating, electric lighting and ventilating arrangements throughout. The private general cabins and saloons, vestibules, smoking rooms, etc., are beautifully upholstered and decorated, and the vessel ranks as one of the finest engaged in cross-channel traffic.

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Photo] [*R. J. Purves.*

NORTH EASTERN RAILWAY:
8 a.m. Newcastle–King's Cross Breakfast Car express,
4–4–2 three cylinder engine (Schmidt superheater) No. 735.

Modern British Restaurant Car Services.

[No. III.—Concluding.]

"By VOYAGEUR."

The first of these articles was published in "The Railway Magazine" in February, and the second in April, 1913.

METHOD and celerity are together the keynote of all success in restaurant car operation. Very often a complete *table d'hôte* meal of five or six courses has to be served within the brief compass of three-quarters of an hour, which means that all arrangements must be at the highest pitch of efficiency, especially if many people are to be supplied. On the other hand, there may sometimes be a constant succession of meals to serve, with all the necessary washing up of crockery and plate between each relay. For instance, on the 10 a.m. express from Edinburgh (Waverley) to King's Cross, one lunch is served between Berwick and Newcastle, beginning at about 11.50 a.m., and continuing until the arrival at Newcastle at 12.34 p.m. Nine minutes are spent at Newcastle, and the second lunch is served between that city and Darlington—a 46-min. run. After five minutes in the latter town, a third lunch is ready on the 47-min. trip thence to York, reached at 2.23 p.m. Even then, leaving York at 2.31 p.m., there is generally a fourth lunch required for a few belated travellers joining at that point. Such a period as this obviously means a fairly strenuous time for the staff, as there is also included the presentation of bills and the collection of money after each meal, for which due time must be allowed. Methodical working, therefore, is a *sine qua non*, if the efficiency of the service is to count for anything; added to which scrupulous cleanliness must also be the order of the day, if the reputation of the Company is to be maintained.

A few remarks must, in conclusion, be made in connection with the actual restaur-

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ant car train services of each line in amplification of the table which appears in the present issue. I shall take the summer figures as representative of the maximum activities of each company. First in order, numerically speaking, comes the Great Western Railway, with a total of 88 trains daily, 79 of which are what might be called "native" and the other 9 "foreign"—two London and North Western, three London and South Western, and four Great Central expresses. Working from Liverpool to Bristol and Plymouth, the first-named run over Great Western metals from Hereford southwards *viâ* Pontypool Road and the Severn Tunnel. Two of the London and South Western trains are the well-known Birkenhead and Bournemouth expresses, travelling over the Great Western line as far south as Basingstoke, although hauled by London and South Western locomotives to and from Oxford, while the other is an express from Bournemouth to Newcastle *viâ* the Great Central line, worked in one direction daily with London and South Western rolling stock. The Great Central through restaurant car trains comprise three services—Leeds and Bristol, Newcastle and Barry (Cardiff), and Newcastle and Bournemouth. In each case the Great Western line is reached at Banbury, and, in the case of the Bournemouth train, is left again at Basingstoke. Newcastle and Barry service is worked in one direction only by the Great Central Company daily, the Great Western Company furnishing the train for return, and similarly, as just mentioned, the Bournemouth and Newcastle service, worked in conjunction with the London and South Western Railway. It should here be mentioned that no

BRITISH RESTAURANT AND PULLMAN CAR SERVICES.

Note.—The totals shown at the foot do not include the same cars more than once when running over more than one line.

Railway.	No. of trains worked daily.		No. of trains jointly worked daily.		No. of trains worked by foreign Co.'s daily.		Total No. of trains daily.		No. of trains worked on Sundays.	
Restaurant Car Trains.	Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter
G.W.R.	79	73	—	—	9	9	88	82	15	14
L. & N.W.R.	69	54	18	14	2	2	80	70	11	11
Midland R.	50	45	12	10	2	—	64	55	10	10
N.E.R.	11	8	14	8	17	16	42	32	§5	§5
N.B.R.	20	16	16	8	4	4	40	28	‖4	‖4
G.E.R.	33	29	—	—	2	—	35	29	10	8
L. & S.W.R.	35	25	—	—	1	1	36	26	10	6
G.N.R.	19	14	14	8	1	—	34	22	§8	§8
Caledonian R. ..	5	5	18	15	—	—	23	20	2	2
L. & Y.R.	8	8	—	—	14	14	22	22	—	—
G.C.R.	20	18	—	—	2	2	22	20	4	4
G. & S.W.R.	2	2	8	6	—	—	10	8	—	—
G.S. & W.R.	6	6	—	—	—	—	6	6	—	—
G.N.R. (I.)	4	4	—	—	—	—	4	4	—	—
Midland (N.C.C.) ..	4	2	—	—	—	—	4	2	—	—
M.G.W.R.	2	2	—	—	—	—	2	2	—	—
D. & S.E.R.	2	2	—	—	—	—	2	2	—	—
Total ..	360	313	44	32	54	48	404	345	74	67
Pullman Car Trains.										
L.B. & S.C.R.	42	42	—	—	*2	*2	44	44	15	15
S.E. & C.R.	†17	†15	—	—	—	—	17	15	10	10
Metropolitan R. ..	10	10	—	—	—	—	10	10	—	—
Total	†69	†67	—	—	*2	*2	71	69	25	25
Grand Total ..	429	380	44	32	56	50	473	412	99	92

† Includes four American Car Trains and one Tea Car Train. * Restaurant Cars.
‖ Includes two N.E. Trains. § Includes three G.N. & N.E. Joint Trains.

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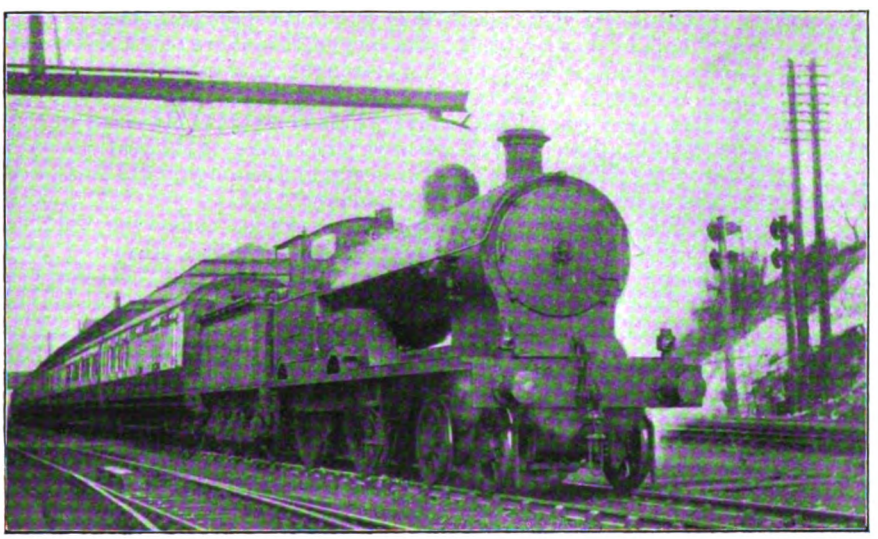
through service, or "foreign" working, is included in the table unless the train makes at least one stop on the "foreign" line. Thus, for instance, the Great Western Bristol and Birmingham expresses working over the Midland line between Yate and Cheltenham are not shown in the Midland list of trains worked by "foreign" companies, neither are the Great Northern through trains *viâ* Harrogate, shown as using the Lancashire and Yorkshire line from Askern to Ferry Bridge, *viâ* Knottingley.

With a system of such vast extent as that of the Great Western some curious cross-country journeys are made, such as Birmingham and Cardiff, *viâ* Hereford, or Wolverhampton and Penzance, *viâ* Stratford-on-Avon. The longest distance restaurant car service in operation is that from London to Penzance, 305¼ miles, although this is run very close by the Wolverhampton and Penzance service, which covers 299¼ miles of country. On the other hand, the shortest run is that of the car on the 7.50 a.m. train *ex*-Cardiff, which runs to Gloucester only, a distance of 56¼ miles. The next shortest runs are between Paddington and Oxford, 63¼ miles. These replace those of the old Birmingham service, now diverted to the new short route *viâ* Bicester. A Great Western speciality—in which respect with the Midland and Great Central lines it stands alone—is the provision of restaurant cars on cheap day excursion trains. The routes particularly favoured are those of the weekly half-day corridor trips to Weston-super-Mare and Weymouth, with other occasional trips to Gloucester and Tintern or the Wye Valley, and to Malvern. On these cars an excellent meal, consisting of soup, joint, vegetables, sweets and cheese is served at the modest charge of two shillings, and the luncheon on the outward journey and supper on the return are extensively patronised, in view of such popular charges being advertised.

Among minor curiosities in working may be mentioned the case of Newquay and Ilfracombe, which see restaurant car trains during the summer months only. A particular record relating to the latter service is that a complete restaurant corridor train is "slipped" from the 11.50 a.m. Torquay express *ex*-Paddington at Taunton for Ilfracombe. On the Midland line most of the slip coaches are now vestibuled to the trains to which they are attached, so that passengers may make use of the restaurant car up till the time the train is severed. This practice, by the way, might be commended to the Great Western authorities in connection with Leamington, which enjoys a magnificent restaurant car service of nine trains daily to London, with only two in



Photo] [*H. Kelland.*

LONDON AND NORTH WESTERN RAILWAY:
New 4–4–0 locomotive (Schmidt superheater), F. W. Webb at Carnforth.

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the reverse direction, most of the down connections being effected by slip coaches. A final novelty is in the provision of restaurant and sleeping cars on the same train, this being the case with the night boat expresses between Paddington and Fishguard.

With a total of 80 restaurant car services daily, the London and North Western Company run the Great Western fairly close. These include 60 purely London and North Western trains, 18 West Coast joint trains (managed jointly with the Caledonian Company), and 2 "foreigners." The West Coast joint cars conform so much, however, to the usual London and North Western practice in design and catering as to be to all intents and purposes London and North Western cars. It is also probable that the London and North Western Company has at least as many, if not more, cars running than the Great Western, as in numerous cases the cars are in pairs, and on other trains, such as the 10.30 a.m. *ex*-Euston, three twelve-wheeled cars are conveyed daily, a total of 130 tons of train weight being thus utilised for restaurant purposes. Such expresses as the 5.55 p.m. down Liverpool and the 6.5 p.m. Manchester *ex*-Euston frequently take four, or even sometimes five, cars for dining purposes—used, of course, as seating accommodation throughout the journey. The two "foreign" services are Great Western expresses between Plymouth, Bristol and Liverpool, working from Shrewsbury over London and North Western metals. There are two return services over this route—one from Liverpool to Bristol and back, and the other to Plymouth and back. Each of the two companies has one train running on each service, so as to balance the working. Another "foreigner," during recent summers, which has not re-appeared in this season's time-tables, was the south-bound Midland Scotch express from Carlisle to London, which travelled *viâ* Penrith and Ingleton over the London and North Western line as far as the latter point.

Most of the North Western restaurant car services radiate from London, although among cross-country trains there might be mentioned the through express from Cambridge to the English Lakes, which takes a restaurant car from Bletchley to Windermere. The longest joint restaurant-car journey is from Euston to Glasgow, 401½ miles, while the longest worked by purely London and North Western stock is the alternate day train between Liverpool and Plymouth, 281½ miles. Conversely, the shortest trip is that of the breakfast car on the 8.0 a.m. train *ex*-Liverpool, which runs to Stafford only, 58¾ miles. Credit for the most curious journey might be given, I think, to the "City to City" express which finds itself daily in Broad Street station, London. A record enjoyed by the West Coast companies is that of attaching three independent restaurant cars to the same train on different portions of its journey. The train in question is the 6.45 a.m. from Aberdeen to London, which, during the recent summers, has attached a breakfast car from Aberdeen to Perth, a luncheon car from Carlisle to Preston, and a tea car from Crewe to Euston. Thus restaurant car accommodation is available at all the necessary meal-times, while the cars employed are saved the necessity of exceptionally long journeys, and are free to work back to their respective starting points over these comparatively short distances at convenient times. This year, however, the car is running through daily from Aberdeen to London.

Next on the list comes the Midland Railway, with 64 services, including 12 jointly worked, but only two "foreign" trains. These latter are the new restaurant car expresses inaugurated on July 1st by the North Eastern Railway between Sheffield (Midland station) and Bridlington, using the Midland line as far as Swinton. The joint trains include eight Midland and Glasgow and South Western, working between London and Glasgow in the case of three double journeys, and between Manchester and Glasgow in the other, and also four Midland and North British, working between London and Edinburgh. Here again the cars correspond so closely to Midland cars in every respect as to be, to all intents and purposes, Midland cars. The longest daily journey is, of course, between St. Pancras and Glasgow, 424 miles. Cross-country restaurant car travel is confined to the West of England main line, the most unusual journeys being those of the Bristol and York and the Nottingham and Bournemouth expresses. Beyond these trains the working of restaurant cars on the West of England line is confined to the Derby and Bristol section, over which an ample service is run.

The Midland Company and one of its Scottish partners make a feature of running restaurant and sleeping cars on the same train. This distinction is enjoyed by the

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7.10 p.m. Highland express and the 8.15 p.m. Glasgow and Stranraer express *ex*-St. Pancras, on which, south of Derby and Nottingham respectively, passengers may enjoy the luxury of dining before retiring to rest. The former train and the sleeping cars on the latter run, however, during the summer months only. A similar all-the-year round facility is also provided on the 12.0 midnight express from St. Pancras to Glasgow, to which a breakfast car, worked by the Glasgow and South Western Company, is attached at Carlisle, enabling passengers to obtain an excellent *table d'hôte* breakfast after the night journey, and thus leaving them free to transact business immediately on arrival in the northern city.

Fourth place on the list is held by the North Eastern Railway, but only 11 out of its total of 42 services are worked independently with North Eastern cars and staff. Fourteen services are jointly worked, ten being with East Coast Joint cars, and the remaining four with Great Northern and North Eastern Joint vehicles. So large a total, however, is due to the number of foreign lines whose restaurant car trains work over the North Eastern system into and out of York, numbering 11 in all. They include the Great Eastern Railway Continental boat expresses in each direction, the Great Central and London and South Western Bournemouth and Newcastle expresses (worked by each company in turn), the Great Western and Great Central Barry and Newcastle expresses (also worked by each company in turn), the Lancashire and Yorkshire Railway Liverpool and Newcastle expresses (to York only during summer months), and the Midland Bristol and York expresses—five services making 10 trains in all, and worked over North Eastern metals from Shaftholme Junction, Pontefract or Normanton as the case may be. The odd train is the summer express between London and Scarborough, worked in one direction daily by the Great Northern Company, and in the other by the North Eastern Railway. There are also the two through Newcastle and Liverpool trains, which are composed of London and North Western rolling stock, with restaurant car, and travel over the North Eastern Railway between Newcastle and Leeds, *viâ* Harrogate. Apart from these services, there are the Great Northern through expresses from London to Hull and from London to Harrogate and Ripon, the former worked over North Eastern metals from Thorne Junction to Hull, and the latter from Knottingley to Ripon by a Great Northern locomotive throughout.

The longest through run of any purely North Eastern car is from Leeds to Glasgow, 278¼ miles, while the shortest journey is from York to Newcastle, 80½ miles. One of the sets of joint Great Northern and

Photo] [*H. T. Worlock.*

GREAT EASTERN RAILWAY:
Norwich–London Luncheon Car train. 4–4–0 locomotive No. 1858.

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North Eastern cars which is managed by the North Eastern Railway Company, however, covers the longest daily mileage but one of any I have yet been able to trace in the United Kingdom, leaving Newcastle at 8.0 a.m. for King's Cross (due 1.30 p.m.), and returning at 5.30 p.m. to Newcastle (due 10.48 p.m.). In this case the total distance covered is 537 miles each day, and a record is thus created in that *table d'hôte* breakfast, luncheon and dinner, and *à la carte* tea and supper are served on the same cars daily, and all to comparatively large numbers. The attendant's mileage must increase at a tremendous rate, as each week sees a fresh 3,222 miles added, and each year something like 150,000 miles, allowing for holidays and rests. At busy times on this popular express the staff of these cars numbers no fewer than nine, three waiting in the first class and three in the third, while a further three—chef, assistant chef, and kitchen porter—are occupied in the kitchen. The rival service for distance is that in operation on the West Coast Route between London and Aberdeen, 540 miles, but this car is only run during the summer months, and, moreover, is only used for the service of luncheon, tea and dinner when running north, and breakfast, luncheon and tea when running south, and not for the five meals in the one day. The only curiosity in North Eastern Railway restaurant car working that has attracted my notice is in the case of the 10.35 a.m. express from King's Cross to Edinburgh, and the 7.45 a.m. return train to London. These are East Coast Joint trains, but until recently, for purposes of convenience, they were provided with Great Northern and North Eastern joint cars between King's Cross and Newcastle, and North Eastern cars between that point and Edinburgh. As a matter of fact, both trains underwent an extensive re-marshalling at Newcastle, only a comparatively small through section in each case being in use beyond that point. With the cancellation of the cars on the 2.20 p.m. Scotch express *ex*-King's Cross beyond Newcastle, which came into force on October 1, 1912, this arrangement is only now in force on the up train.

With 40 services daily, the North British Railway is in much the same position as the North Eastern Railway as regards the working of jointly-owned and "foreign" cars. The jointly-worked services, totalling 16 of the 40, are again divided into two, ten of them being East Coast Joint trains, and the other six Midland and North British Joint trains. One of these cars, a fine composite twelve-wheeled coach, works between Edinburgh and Carlisle only, passengers south of the latter city being able to make use of the Glasgow vehicles. "Foreign" cars working over the North British line, four services in number, are all North Eastern vehicles, the latter company, as is well known, working its own trains into Edinburgh. The cars on the well-known 9 a.m. express *ex*-Leeds work through to Glasgow, returning at 5.0 p.m. to the South. The splendid service of North British restaurant car expresses connecting Edinburgh and Glasgow at all hours of the day shares, with the summer Edinburgh and Perth service (each a run of 47¾ miles), the distinction of having the shortest restaurant car journey in Scotland, and very nearly also in the United Kingdom. At the same time this enterprising policy of establishing frequent restaurant car services between two important centres, even if situate within little more than an hour's journey of each other, has, beyond question, proved its value to the company.

The Great Eastern Railway should rightly follow the Midland in the table, seeing that no fewer than 33 out of the summer total of 35 services are "native," two only being "foreign." These latter are the Great Central expresses, which run during the summer months between Manchester and Yarmouth—one daily in each direction, furnished with the usual Great Central buffet car. In the winter these trains are replaced by a single through coach without restaurant car accommodation. The Great Eastern Company can lay claim to several restaurant car "records." By far the shortest restaurant car journey in the kingdom is that of the Great Eastern Railway Southend service, with a run of only 41¾ miles, covered in about an hour. Two double journeys are made daily. In addition, the tariff in use on these cars is unique, but need not further be referred to, having been dealt with earlier in these articles. The Great Eastern Railway boasts a greater outgoing service of restaurant car expresses in the evening than any line running out of London, this being a good illustration of the Great Eastern policy for inducing business men to live in the country by providing breakfast trains to town, and

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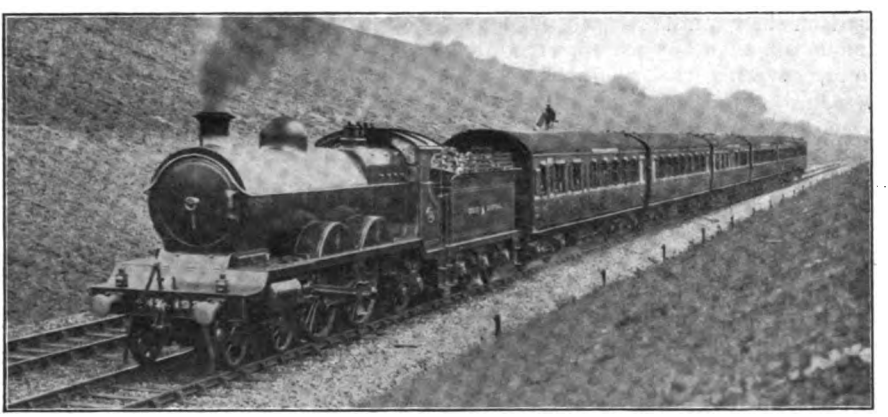
tea and dining trains for the return evening journeys.

Five restaurant car expresses actually leave Liverpool Street daily within a total of 17 min. (4.55 to 5.12 p.m. inclusive), and eleven (ten, winter service) during the evening onwards from 4.55 p.m., against seven on the Great Western and six each on the Midland and London and North Western lines. Yet another record is the provision of midnight supper trains, one to Southend daily, and one to Clacton-on-Sea every Saturday night. The latter express was inaugurated as far back as 1897, and was one of the earliest restaurant car trains to run on the Great Eastern Railway. The longest restaurant car journey is that of the North-country Continental boat express—historically the earliest of all Great Eastern restaurant car trains—which covers the distance of 220¾ miles between Harwich and York in each direction daily. On this train dinner on the south-bound journey is the only *table d'hôte* meal, breakfasts, luncheons (when required), teas and suppers being obtained *à la carte*. The special features in Great Eastern Railway restaurant car working are the number of restaurant car trains stopping at almost all stations. There are, for instance, on the winter service the 7.8 a.m. Ipswich to Lowestoft—all stations throughout; the 11.45 a.m. Liverpool Street to Yarmouth—all stations beyond Mark's Tey; and the 10.0 a.m. Norwich Thorpe to London—all stations to Ipswich, and a good many beyond. This is, I believe, without any parallel in the United Kingdom. On the round tour effected by the cars on the 7.8 a.m. *ex*-Ipswich breakfast is served *en route* to Lowestoft, luncheon on the way from Lowestoft to London *viâ* Cambridge, and dinner on the return journey direct from Liverpool Street to Ipswich. A happy little custom in the Great Eastern restaurant cars is that of placing vases of fresh flowers on all the tables, greatly enhancing the internal appearance of the vehicles; the practice is now copied by the Great Western Railway.

Next on the list comes the London and South Western Railway, with 35 services, of which none are jointly operated, and only one is "foreign." The latter is the Great Central express which works between Bournemouth and Newcastle, using London and South Western metals as far as Basingstoke. A corresponding train in the opposite direction is provided by the London and South Western Company. No cross-country services are in operation. Certain branch lines enjoy a through restaurant car service during the Summer months only—these being the North Cornwall line as far as Padstow, the branch from Yeoford to Barnstaple and Torrington, with its direct connection to Ilfracombe, and the Swanage branch. The principal point about the London and South Western restaurant car catering is, that it is leased to contractors (Messrs. Spiers & Pond, Ltd.) instead of, as usual, being managed by the company itself. In the Summer there are more restaurant car trains to and from Bournemouth on Sundays than on week-days, the totals being eight on the first day



Photo] [*F. E. Mackay.*

GREAT CENTRAL RAILWAY:
12.15 p.m. London–Manchester Luncheon Car express, 4–4–2 locomotive No. 192.

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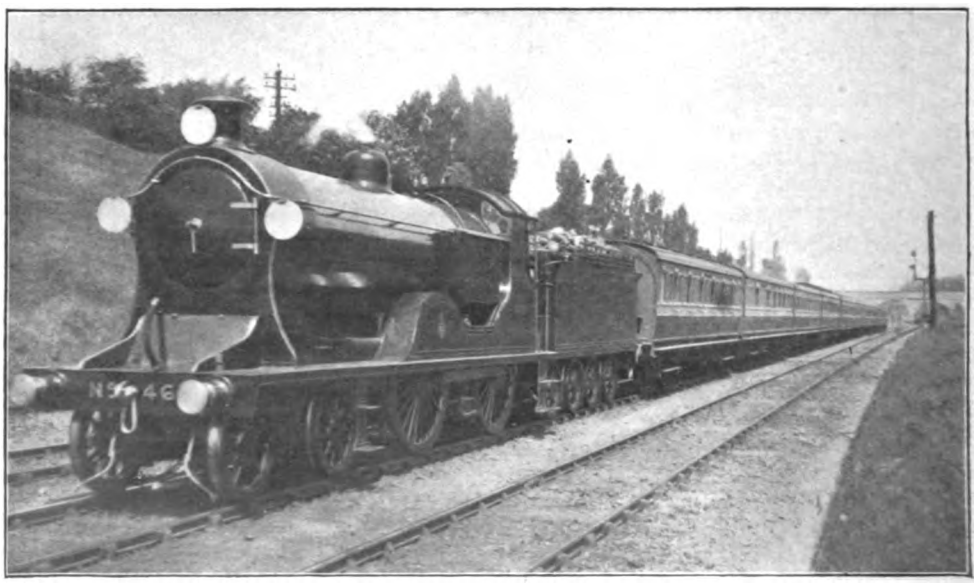
of the week and on Monday, and seven on each other day. The odd number on weekdays is explained by the fact that the summer Swanage express travels *viâ* Ringwood on the down journey and *viâ* Bournemouth on the return. On the Winter time tables ten of the restaurant car services daily on the Bournemouth and Exeter main lines are withdrawn. The Waterloo and Portsmouth trains perform the shortest restaurant car journey on the London and South Western Railway, the distance being only 74½ miles.

The Great Northern Railway, with a total of 34 Summer restaurant car trains, runs the London and South Western Railway very close. Of these 10 are East Coast Joint and 4 Great Northern and North Eastern Joint. Of the former the 10.0 a.m. *ex*-King's Cross and the corresponding return train at 6.20 a.m. *ex*-Aberdeen had until recently a longer continuous run than any cars in the United Kingdom, covering the whole 523½ miles daily. On these trains luncheons are the meals most extensively patronised, there being usually three servings on the down train and four on the up. Tea, also extremely popular, is served almost continuously from three o'clock till five in the afternoon. These cars now terminate at, and start from Edinburgh, a separate car being provided between that point and Aberdeen, on which dinner is supplied on the down train and breakfast on the up journey. The solitary "foreign" restaurant car train is the Summer express on the Scarborough service, which is worked in one direction daily by the North Eastern Company, and in the other by the Great Northern. Cross-country services only four in number run during the Summer months only, in two pairs—Bradford to Lowestoft and back, and Nottingham to Skegness and back. The latter, a buffet car service, is the shortest in operation on the Great Northern Railway, covering a distance of only 79½ miles.

Next in the list is the Caledonian Railway, owing to the large number of cars jointly operated with the London and North Western Railway, totalling 18 services out of 23. The various cars working on this system are arranged so that a vehicle on which, say, breakfast has been served on one train may be taken off at some convenient point, and utilised as a luncheon car on the next express in the reverse direction. These cars work thus between Glasgow and Perth, Symington and Perth, and Perth and Aberdeen.

Twenty-two services daily compose the



Photo] [*H. E. Ambrose.*

LONDON AND SOUTH WESTERN RAILWAY:
Down Bournemouth, Swanage, and Weymouth Luncheon Car express,
New 4–4–0 locomotive, No. 466.

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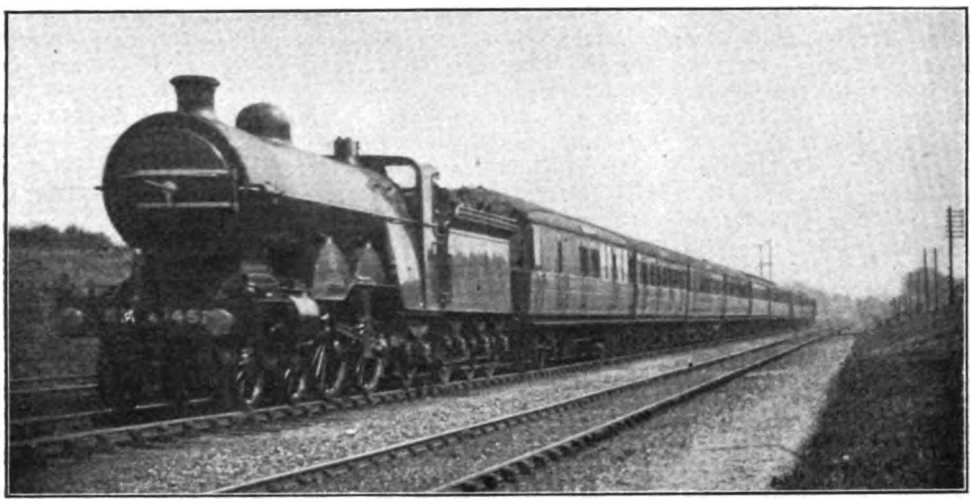

Photo] [*W. M. Smith.*

GREAT NORTHERN RAILWAY:
1.30 p.m. down Leeds and Bradford Luncheon Car Express,
4–4–2 locomotive, No. 1452 (Schmidt superheater).

Lancashire and Yorkshire Railway total, although of these no fewer than 14 are worked by foreign companies. Four of the 14 are the Great Central expresses between London and Bradford, working over Lancashire and Yorkshire lines from Penistone to Bradford, *viâ* Huddersfield, two in each direction daily. Six are worked by the London and North Western Company, one pair being the Fleetwood boat expresses, and the other four through Liverpool, Manchester, and Glasgow expresses, using Lancashire and Yorkshire metals from Preston to Fleetwood, and Liverpool and Manchester to Preston respectively. A North Eastern restaurant car express from Newcastle works daily over the Lancashire and Yorkshire line from Normanton to Liverpool and back, and a Midland restaurant car train also runs during the Summer from Manchester to Hellifield over the Lancashire and Yorkshire Railway *en route* to Glasgow, and back daily, these two services in each direction furnishing the remaining four. The longest journey undertaken by Lancashire and Yorkshire cars is from Liverpool to Newcastle, 182 miles, and back daily, while the shortest is between Manchester and Blackpool, 48¾ miles. At one time the Lancashire and Yorkshire Company worked a unique car on the Fleetwood and Leeds boat train—I am not aware whether it is still in use—the kitchen end of which was mounted on a six-wheeled bogie, and the opposite end on a four-wheeled bogie, this being a somewhat unusual combination.

A total of 20 restaurant car trains is noteworthy in the case of the Great Central, both in view of the fact that all but two of them are worked by the company itself, and also because of the large number of foreign systems over which the cars work. These systems include the North Eastern, the Great Eastern, the Lancashire and Yorkshire, the Great Western, and the London and South Western Railways. The two "foreign" trains are the Great Western express on the Barry and Newcastle service and the London and South Western train on the Bournemouth and Newcastle service, each of which works alternately with a Great Central train. The Great Central Railway may claim to have done much pioneering work in connection with catering on wheels. In fact, I am not at all sure that much of the present widespread ramifications of restaurant car operation could not be traced to the original advertised intention of the Great Central Company, on extending to London in 1899, to have "every express train vestibuled, with buffet car attached." Not only so, but the Great Central Railway has set a notable example in providing the true "restaurant" car, in which restaurant fare can be obtained at restaurant prices, and at all times.

The remaining lines may be mentioned in a few words. Eight of the ten services on

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the Glasgow and South Western Railway are worked by joint Midland and Glasgow and South Western cars, the others being operated by the Glasgow and South Western Company. In the latter case the car employed is attached to the 6.28 a.m. *ex*-Carlisle (12.0 midnight *ex*-St. Pancras) for the service of breakfasts and to the 5.30 p.m. *ex*-Glasgow as a "refreshment" car. This was at one time run between Glasgow and Turnberry for the use of golfers, but the service was not continued. The provision of restaurant cars over routes so sparsely populated as those of Ireland is an evidence of enterprise greatly to be commended. Of the Irish totals the six services of the Great Southern and Western include the double journeys of the boat trains, working twice in each direction between Rosslare and Cork. The cars of the Midland (Northern Counties Committee) are provided on two expresses in each direction between Belfast and the popular resort of Portrush. On the Dublin and South Eastern, Midland Great Western and Great Southern and Western main lines one restaurant car "limited" express runs in each direction daily, this proving the best means of dealing with the scanty traffic gleaned from these routes. The heavier traffic between Dublin and Belfast is met by the Great Northern Company in the provision of a breakfast car and a dining car express in each direction daily. All the Irish companies running into Dublin arrange their mail trains, in which the restaurant cars are included, at such times as to connect with the English steamers at Kingstown Pier, through coaches being available to that point. On this account, therefore, breakfast is served on the outward-bound limited expresses from Dublin, and dinner on the return journey. It should be added that the majority of the Irish cars are for the use of first and second-class passengers only.

Pullman car services are tabulated separately, the London, Brighton and South Coast easily leading the way with 42 Pullman car trains daily. There is also one "foreign" restaurant car express—the London and North Western "Sunny South Special," with a through dining saloon from Manchester to Brighton. A total of 17 on the South Eastern and Chatham includes the four journeys of the "American Car" trains, which are not really Pullman coaches, although light refreshments may be obtained in them, and also the "tea car" which is run on the express from the Northern lines to the Kent Coast resorts. The Metropolitan Railway completes the list of lines using Pullman cars in these islands. It might also be mentioned that light refreshments may be obtained on sleeping cars in this country, but only the lightest of "light" refreshments are to be obtained.

Photo] [*H. T. Warlock.*

GREAT NORTHERN RAILWAY:
Down Restaurant Car Express from King's Cross.
"Atlantic" locomotive, No. 1459 (Schmidt superheater).

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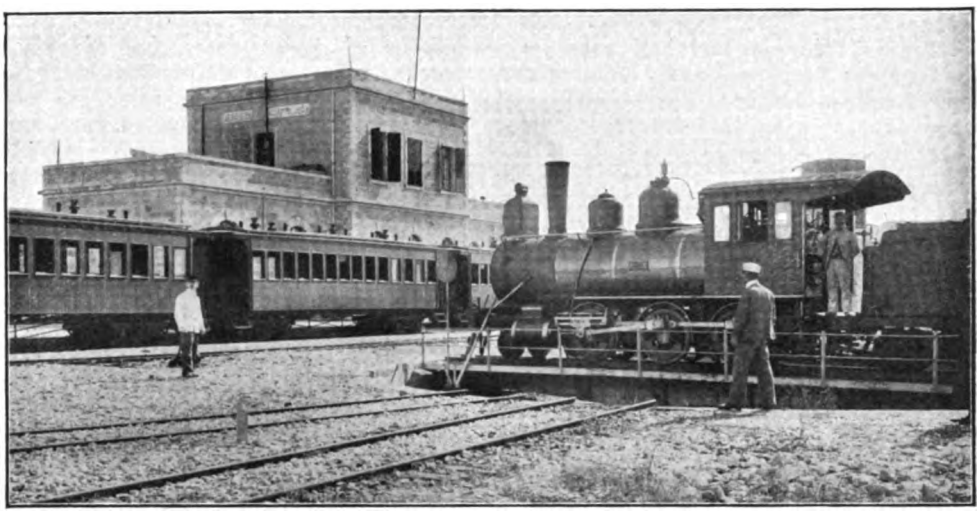

JAFFA-JERUSALEM RAILWAY: JERUSALEM STATION, SHOWING ROLLING STOCK AND ENGINE ON TURNTABLE.

(Photograph by the American Colony, Jerusalem.)

To Jerusalem and Mecca by Train.

RAILWAY DEVELOPMENT IN THE HOLY LAND.

By HAROLD J. SHEPSTONE.

THE decision of the Turkish Government to carry the lines of the Hedjaz Railway with all speed across the 285 miles of desert between Medina and Mecca, to join up Jerusalem with this route, thus placing Mecca and the Holy City in direct railway communication with Damascus and later on with Constantinople and the rest of Europe, calls attention to the railway development in that sacred country. Indeed, Palestine is being gradually covered with a network of railways, and to-day the screech of the locomotive may be heard not only in Jerusalem, but on the shores of the Sea of Galilee and in many other places associated with Biblical history.

In this historic land the first railway to be opened was that which runs from the seaport of Jaffa to Jerusalem. The distance by rail is 45 miles, and the journey occupies three hours and forty minutes. Often it takes much longer, and not infrequently travellers are five or six hours upon the road. By a curious arrangement, the trains, besides passengers, carry only the Turkish mails; the foreign post offices in Jerusalem having to bring their mails from Jaffa by horse-drawn wagons. Except in the height of the tourist season, there is only one train a day, which leaves the seaport at 1.30 p.m. As the steamers invariably arrive early in the morning, one is afforded an opportunity of seeing the city before proceeding to Jerusalem. Jaffa is at once picturesque and Oriental, with its clusters of palms and white flat-roofed houses. It is one of the oldest cities in the world, although some people ignore the tradition that it was founded by one of Noah's sons. It has been the chief port of Jerusalem since Solomon's time, and it was here that he landed his materials for the building of the Temple.

Leaving the city, the train plunges into the beautiful and extensive orange groves in the richly cultivated plain of Sharon. Soon the modern village of Yasur is seen on the left. It was here, according to tradition, that Samson caught three hundred foxes. The first stopping place of any importance is Lydda, the site of Lod, which was built

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1400 B.C. Thirteen and half miles from the terminus, the journey so far occupying an hour, Ramleh is reached. It is the traditional site of Arimathea, mentioned by St. Matthew. There is in the town the old Crusaders' church, now used as a mosque. Crossing the carriage road we detect away to the left, on the top of a mountain, Neby Samuel, the Mizpeh of the Old Testament. It was at this spot that all the Children of Israel, from Dan to Beersheba, were several times called together. Saul, the first King of Israel, was chosen at Mizpeh. Our course now lies across the plain of Lejed, when we begin to ascend what is known as the "hill country" to Judea. We pass to the left of Beth Shemesh, where the Ark rested, and are soon at the station at Deir Aban. Another hour and a quarter brings us to Bittir. According to Jewish history, this was a place of great strength. It contained 400 synagogues, each of which boasted as many teachers. Here the Jews made their last stand against the Romans. The siege lasted three years, and when the place fell it is recorded that 800,000 persons were slain.

Progress is so slow that it requires only an ordinary amount of activity to jump out, actually pick the flowers along the line, and rejoin the train as it laboriously moves up the steep incline. American tourists are particularly fond of performing this feat. Jerusalem does not come into view until the train is quite close to the city, the first objects to meet the eye being the Tower of David and the city walls. During the trip of 51 miles from the sea the total ascent is not less than 2,600 feet. The line was built by the French at a cost of a little over £600,000. For many years this interesting railway was the only one in the Holy Land. Now there are three others, comprising those from Beirut to Damascus, from Haifa round the Sea of Galilee to Damascus, and the Mecca or Hedjaz enterprise, which carries Mohammedan pilgrims from Damascus to Medina, the birthplace of Mohammed.

Beirut, on the Mediterranean, is by rail 91 miles from Damascus, and the journey takes nine and a half hours. The railway is a narrow gauge, and for climbing the mountainous portion (about 20 miles) a cogwheel and rack system is employed. Tourists making the journey invariably leave the train at El Mulakka, 35 miles from Beirut, and go by road to the ruins of Baalbek. This was once the most magnificent of Syrian cities, full of palaces, fountains, and beautiful monuments. Now it is famous only for its ruins, the most imposing of which are those of the Temple of the Sun. The railway was also built by the French, and crossing as it does the Lebanon, passes through some really beautiful scenery. The Haifa to Damascus line owes its inception to the Mecca railway. When the latter work was put in hand, all materials for its construction had to be carried from Beirut to Damascus by the French railway. The rates charged the Turkish government by the line were so high, however, that it was decided to build this side line, giving them a direct communication with a seaport. The gauge is 4½ ft., and the track was laid by British engineers. As it runs across the Province of Galilee and touches many places mentioned in the New Testament, it is naturally much patronized by tourists.

Skirting the foot of Mount Carmel, sacred to the Prophet Elijah, the railway runs to Afuleh, close to Nazareth. This is the first stopping place of any importance. To-day Nazareth is a flourishing town of 10,000 inhabitants, the majority of whom are native Christians. It was originally intended to continue the railway round the western shores of the lake. Had this been done, Tiberias, Magdala, and Capernaum would have been connected with the Mediterranean by rail. The engineers, however, finally decided to run the iron road round the southern end of the lake. The track passes through Semakh, at the southern extremity of the Sea of Galilee, from which boats carry passengers across to Tiberias. From Semakh the line ascends the wild gorge of the Yarmuck, going thence to Daraa, where it joins the main line from Damascus.

The Hedjaz project claims to be the only railway built for the purpose of carrying pilgrims. Indeed, it is known as "The Railway of the Pilgrims." Starting from Damascus, it runs almost due south through wild and sterile country for more than 820 miles to Medina. The steel rails used were imported from the United States, as were also the iron ties. Rolling stock came from Belgium and Germany, the first-named country supplying the freight cars, and the latter the passenger cars. It was the deposed Sultan of Turkey who suggested the construction of this railway, and the Turkish Government handed over to the Commission appointed to carry out

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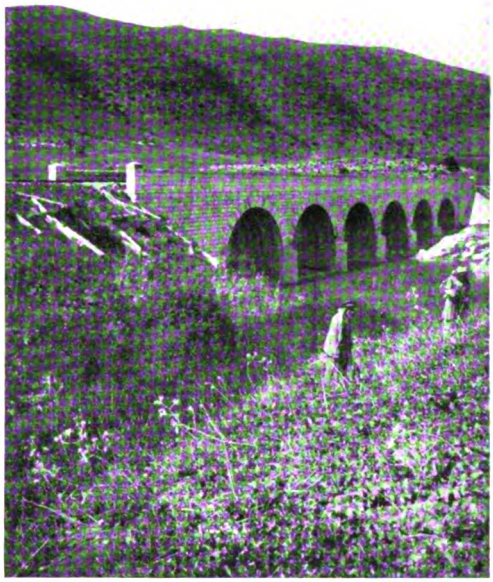
RAILWAY STATION AT AMMAN (ANCIENT PHILADELPHIA).



THE RAILWAY BRIDGE OVER THE RIVER KISHON, ON THE HAIFA-DAMASCUS RAILWAY. MOUNT CARMEL IS SEEN IN THE BACKGROUND.

JERUSALEM STATION: JAFFA-JERUSALEM RAILWAY.

PILGRIMS ON THE MECCA RAILWAY INDULGING IN A NARGHILE.

VIEWS ON THE JAFFA-JERUSALEM, HAIFA-DAMASCUS AND MECCA RAILWAYS.
(*Photographs by the American Colony, Jerusalem.*)

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the proposal, 17,000,000 unused postage stamps. These were sold by auction to help to finance the scheme. The gauge is one of 1·05 metres (3·445 ft.). A trip over this railway is a fascinating experience. On leaving Damascus, the route enters what is known as the Hauran, a vast plateau devoted almost entirely to the raising of wheat and barley, both of excellent quality. On the west is the snow-capped mountain of Hermon. Daraa is the first station of any importance, and there a large repair shop has been built for repairing disabled locomotives. The station also boasts its restaurant, where good meals may be obtained. There is also a post office and an international telegraph office, from which messages may be sent in any European language as well as in Arabic and Turkish.

At Daraa, of course, the line is joined by that coming up from Haifa. From this spot the Mecca railway gradually ascends the undulating slopes of a plateau as far as Zerka, where it drops into a deep valley, and climbs out again by a winding ascent to another small fertile belt. As the line proceeds southward, signs of civilisation become fewer and fewer, and the sense of wild desolation is more pronounced. Pursuing a course roughly parallel to the Jordan, and almost identical with the old caravan route, the railway traverses a country which is full of history and romance to the religious mind—as much to the Christian as to the Mohammedan. Decayed ruins of a past civilisation and silent monuments of a long departed prosperity are visible on all sides.

At a point almost abreast of the Dead Sea the line enters a barren waste. A foot traveller passing through this region must be astonished at encountering the steel rails and telegraph poles which mean easy communication with distant but more hospitable districts. The interminable level of the sand is broken only on the western horizon, where the mountains of Moab raise their peaks dimly into the heated air. For a considerable distance the going is easy enough from the engineering point of view. Valleys are wide, and contain no steep grades. The engineer could therefore pick his path, and lay his iron road in such a manner as to minimize the work to be exacted from the locomotives. But in one respect the country is difficult—it is practically waterless. During construction every drop of water used by the army of workmen had to be conveyed by train from the nearest well—in some cases many miles away—and stored in carefully guarded tanks. A journey of 285 miles from Damascus, and Maan, or Maan el Hagj, is reached. From this point about eight hours' horseback ride to the West brings one to the unique and fascinating ruins of Petra, and by means of the iron road the tourist of ordinary means is thus able to visit these hitherto inaccessible ruins. Maan itself is now quite an important place on account of its hospital, hotel, repair shops, and other buildings, many of them substantially built of stone. The Turkish government has now established a garrison here. It is believed by some that in time to come Maan will blossom forth as a health resort, since the air is very invigorating, despite frequent dust storms.

Southward of Maan the line traverses high ground more desolate, if possible, than the country already crossed—certainly more rugged. So the journey continues until El Ula is reached, 609 miles from Damascus and 210 from Medina. In some respects this is the most important station on the railway. It is a little town of about 4,000 inhabitants, buried in the heart of the desert. It contains 500 houses, and boasts copious springs and 1,000 acres planted with date palms and cereals. Somewhat imposing and extensive, the station is the last depôt north of Medina, and close to it are repair shops, engine sheds, and houses for the railway staff. Beyond El Ula none but Mohammedans may go! Even the engineer-in-chief, who is a German, had to relegate to a Mohammedan assistant the carrying of the rails into Medina. The railway was projected by the Sultan in 1900, and completed as far as Medina in 1908. It has been principally built by Turkish soldiers. Considering the immense physical difficulties to be overcome, this means the achievement of a remarkable engineering feat. Practically an unknown country had to be traversed, and all materials, stores and provisions for the workmen brought over the line from the seaboard. The road was certainly well and cheaply laid. For the Damascus and Haifa to Medina portion the total cost was only £3,000,000, or about £30,000 per mile.

As already stated, the Turkish government has now announced its intention of carrying the rails into the holy city of Mecca itself. This will be no easy feat, as it means the laying of a track across the desert. When that work has been completed, Mecca will

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be in direct railway communication with Damascus. But we have to look ahead a little to realize what this means in bringing the outposts of the Turkish Empire into railway communication with Europe. From Damascus the Turkish Government have pushed the railway northward to Aleppo, in Northern Syria, where it joins the famous Bagdad project. This latter railway starts from Scutari, the Asiatic suburb of Constantinople on the other side of the Bosphorus. It runs in a south-easternly direction across Asia Minor to Aleppo, whence it strikes eastwards to the Euphrates, which has now been reached. Between Scutari and Aleppo, however, there are two gaps of about 30 miles, caused by the Taurus and Amanus Mountains in Asia Minor. The fact is, the lifting of the track over these mountains is proving no light task. On the Taurus alone 35 bridges and viaducts of varying sizes are being built, whilst the summit of the Amanus range is being pierced by a four-mile tunnel. This work, however, is well in hand, and the engineers have promised to make the connections within the next eighteen months, if not before, which means that within that period one will be able to journey by rail from any of the great centres of Europe, such as Paris, Berlin, or Vienna, to Constantinople, and then across the Bosphorus by ferry to Scutari, and on again over the Bagdad line to Aleppo, from which point Damascus can be reached, as well as Jerusalem and the other sacred cities of Palestine, the Holy City having now been connected with the Damascus and Haifa line.

Seeing, too, that Great Britain and Germany have now come to a satisfactory agreement over the Bagdad line, by which the Persian Gulf section of the railway will come under British control, railway trips to the sacred sites of the Holy Land are likely to become popular in the near future. Indeed, the German syndicate have ordered up-to-date coaches and sleeping and dining cars especially to cater for this traffic. No railway passes through such interesting country. Leaving Scutari, the line skirts for some distance the shores of the Sea of Marmora, and then strikes inland across a thickly-populated and well-cultivated plain to Konia. This is ancient Iconium, a very old city, said to be the first place to emerge after the Deluge. St. Paul visited it twice, once in company with Barnabas and the other time with Timothy. For hundreds of miles through Asia Minor here the railway track follows one of the most ancient highways in the world, the grand route between the Orient and Europe.

Xenophon travelled it with Cyrus as also did Alexander and St. Paul. Hittites, Assyrians, Greeks, Romans, Persians, Mongols, Crusaders, Ertoogrul, the founder of the Turkish Empire, and many others have passed and repassed along here with their mighty armies, their captives and their spoils. Crossing over the Taurus Mountains amid some of the grandest mountain scenery in the world, the line descends into the Cicilian Plains to Tarsus, the birthplace of St. Paul, even to-day no mean city. Once on the sea, it is now several miles inland. It is in the centre of a busy cotton-growing country. Over rolling plains, past quaint bee-hive villages, the journey continues to Aleppo, when the Palestine traveller strikes direct southwards through Hama and Horns to Damascus from which place Jerusalem can be reached. Thus, by means of the Bagdad Railway the historic cities of Asia Minor, the more thriving towns of Syria, and the sacred sites of the Holy Land will be accessible by means of that civilising factor the "iron horse."

The net receipts of the Jaffa-Jerusalem Railway were £33,200 in 1910, £34,000 in 1911, and £31,129 in 1912, the number of passengers in the three years being 168,200, 168,700 and 169,400. Jerusalem subsists mainly on the pilgrim and tourist traffic, and owing to the war in the Balkans, the number of pilgrims travelling second-class fell from 33,500 in 1911 to 24,140 last year, while the goods traffic decreased from 46,400 tons to 37,750 tons. On the other hand, the value of British goods imported in 1912 was £13,000 in excess of that in 1911. [EDITOR].

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Railway Regulation in United States.

A REGULAR reader of the RAILWAY MAGAZINE now engaged upon transport work in Alaska calls attention to the report of the Interstate Commerce Commission of the United States for 1912, and says :—

Prosecutions and the subsequent collection of fines seem to occupy a good deal of the time of the Commission, which states that during the year its prosecutions netted fines and penalties amounting to over $400,000, of which about $275,000 was assessed against railway companies. To the lay reader this would seem to indicate one of two conditions—either excessive legislation, or that the large corporations are inclined to disregard the law. Possibly the actual state of affairs is a combination of the two. There are still a few managers who resent having their business controlled for them by a commission of politicians, although most of them have have become more or less resigned to fate. The prosecutions are divided into four groups :—Offences against the locomotive ash-pan law netted $1,600.00; failures to comply with safety appliance laws for steps, hand-rails, etc., on rolling stock brought in $40,000.00; keeping engine and trainmen on duty an excessive number of hours —sixteen is the legal maximum—brought $25,835.00; and, finally, offences against the Act to Regulate Commerce $344,420.00. Of the last item, traders came in for about 34 per cent. of the fines. Among the offences against the Commerce Act are several which seem queer to the home railwayman. In England a company may more or less use its own judgment as to whether it will extend credit to shippers or insist upon cash on delivery, but in the States a railway was fined $42,000.00 for accepting promissory notes of a coal company in payment of freight charges, and the coal company was likewise muleted in $20,000.00 for tendering the notes. The court held that railways subject to the Act must collect their published charges in money, arrangements for any other form of compensation being criminal. Three gentlemen were also prosecuted by the Treasury Department for using passes to which they were not entitled, and fines of $100 or $200 were imposed.

Many railwaymen, more especially ticket collectors, seem to have an hereditary distrust of theatrical companies. The impression seems to be that the "villain" will not confine himself to the heroine, but will practice his wiles upon the railway company, and smuggle the baby's folding mail-cart in a property basket, instead of duly purchasing a multi-coloured "F.M.C." ticket. But in America we have the case of a number of railway companies and theatrical managers conspiring together. The charge was that the railways paid excessive sums for advertisements in theatrical programmes, in consideration of which the touring companies were routed over their lines. The railways pleading guilty, were fined $10,000 each, and the cases against the theatrical managers are still pending. A trader in Virginia has been fined $4,000.00 for permitting a railway to carry his goods free, while the Company duly came in for a similar penalty. One railway was also fined for "cooking" its accounts on through traffic, with the idea of claiming more than its fair share of the through rate; but in fairness it should be stated that this was not one of the large companies.

In reviewing the accident record, the Commission says that the fallibility of the human element is becoming a disquieting problem. Out of 81 accidents investigated, 52 were caused by mistakes on the part of employés, and resulted in the death of 248 persons. The Commission feels that this state of affairs cannot be entirely charged to failure of discipline, and that it is more or less bound to occur whenever reliance for the safe movement of trains is placed upon human beings. They hint that the remedy lies in the direction of compulsory installation of lock and block and automatic train stops. Discipline in America is very much laxer than at home, owing primarily to the difference in conditions of employment, and, secondly, to the rather pernicious influence of the employés' unions. In the States railway employment is not permanent as it is at home, but is subject to a great deal of fluctuations in traffic, and also to the caprices of subordinate officials, whose judgments are in turn openly quashed or revised by superior officers under pressure from the employés' union—too often without regard to the real merits of the case. One of the results of this system is the "boomer" class—migratory, "devil-may-care" railwaymen, generally of the train, engine or station service—who have little respect for authority, change employers with frequent regularity, and in many cases realise that their employment will last only until there has been time to investigate their previous record. The railways are beginning to feel this evil, but are still very far behind the admirable discipline found on British lines.

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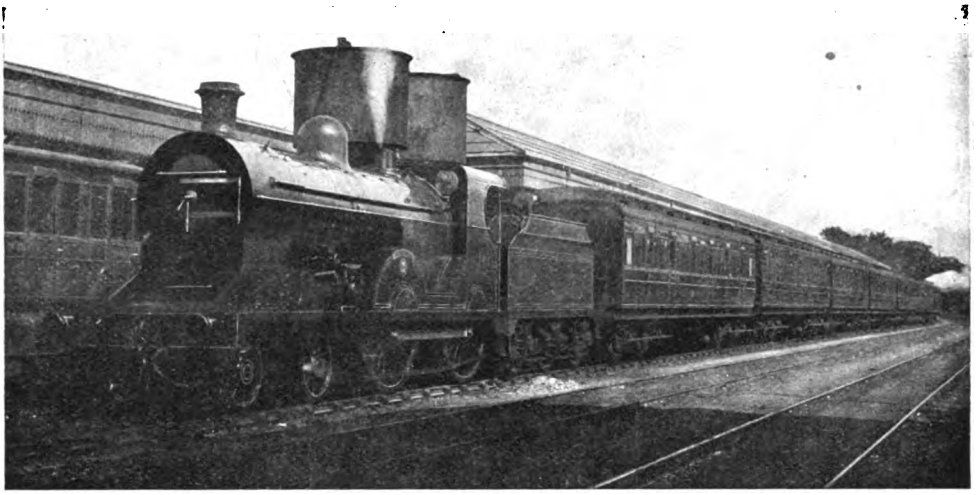

BELFAST–DUBLIN CORRIDOR TRAIN AT DUNDALK: GREAT NORTHERN RAILWAY OF IRELAND.

New Locomotives and Improved Train Services on the Great Northern Railway (Ireland).

IN the RAILWAY MAGAZINE, July, 1913, particulars were given of Mr. G. T. Glover's new express engines for the Great Northern Railway of Ireland, and in our last issue the new goods locomotives were described. One of the former class forms the subject of our coloured plate this month. In both cases Schmidt superheaters and mechanical lubrications are included.

There are five engines of the passenger class, No. 170, *Errigal;* 171, *Slieve Gullion;* 172, *Slieve Donard;* 173, *Galtee More;* and 174, *Carrantuohill.* Nos. 170, 172 and 173 are stationed in Dublin for working the 6.5, 9.0 and 10.45 a.m. trains from Amiens Street and the 2.20, 5.0 and 5.45 trains from Belfast, Nos, 172 and 174 working from Belfast the 7.30 and 9.55 a.m. trains and the 3.0 and 6.0 p.m. expresses from Amiens Street. Partly in view of their capabilities, several of the expresses have this year been accelerated. The two "Limited Mail" trains are now allowed 2½ hours only between Dublin and Belfast. The 2.20 p.m. train from Belfast is now due in Dublin at 5.30 p.m. The 5.30 p.m. train from Belfast has been altered to 5.45 p.m. and accelerated to arrive in Dublin at 8.55 p.m., the same time as hitherto. It conveys a through carriage for North Wall in connection with the London and North Western express steamer sailing at 9.20 p.m. for Holyhead. The 5.50 p.m. express train from Dublin leaves at 6 p.m., but is due in Belfast at 9.0 p.m., the same as before. On Sundays a tea car is attached to the 3.20 p.m. train from Belfast as far as Drogheda, and the 4.45 p.m. train, Dublin to Belfast, has been altered to leave at 6 p.m., and accelerated to arrive in Belfast at 9 p.m. It forms a connection with the day mail packet, *viâ* Holyhead and Kingstown. A dining car runs on this train between Drogheda and Belfast.

Seven trains daily work through from Dublin to Belfast and two on Sundays. Four are expresses, the remainder calling at many or most of the intermediate stations, though shorter-journey trains mainly serve the less important ones. The first of the down expresses is the "Limited Mail." This starts, except for two coaches, from Kingsto n at 5.37 a.m., in connection with the night mail service from England, and is handed to the Great Northern Railway at Amiens Street, from which station it starts at 6.5 a.m. on its northward journey. The train includes some of the best Great

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Northern vehicles, with a breakfast car and mail vans, and is limited to first and second-class passengers, though through third-class tickets from English stations are honoured in the second class. This is the fastest train of the day, being booked to Drogheda in 40 min. (31¾ miles), thence to Dundalk (22½ miles) in 28 min., onwards to Portadown (33¼ miles) in 44 min. (a hard section), and is allowed 33 min. for the final 25 miles to Belfast (also hard for several miles); but rarely exceeds 180 tons, so that its schedule of 155 min. for 112½ miles, with three stops occupying 10 min., is relatively easily accomplished.

Most of the other express trains are, however, considerably heavier, and as a number of stops are included they call for good locomotive work. The first of these expresses is the 9 a.m. from Amiens Street, and reference to an actual experience as far as Dundalk will indicate the warm characteristics of its working. The engine was No. 172, *Slieve Donard*, one of the new superheaters, and the load made up of six large bogie coaches, five six-wheelers and two four-wheeled vans, aggregating about 260 tons. A good start was made. At Raheny (a very pretty station) 50 miles an hour had been reached. By Malahide 60 miles an hour was touched, and although hard work was entailed beyond Rush and Lusk stations, it was relatively easy to reach the first stop at Balbriggan in 28 min. (21¾ miles). Thence to Drogheda the 10 miles took 15¼ min. start to stop, heavy pulling being required beyond Laytown. Leaving the Oldcastle vehicles, and with a reduced load of 220 tons, the 11¾ miles to Dromin Junction and the 10¾ miles onwards to Dundalk were covered in 17¾ and 14¾ min. respectively, in each case start to stop.

At Dundalk the writer left the train, but the gradients between that station and Portadown necessitate good engine work, even with a load reduced by vehicles for Clones, Enniskillen and Bundoran, while at Portadown vehicles from Londonderry are attached, bringing the load to a respectable total for the final stage into Belfast. So that with nine stops, several of some four or five minutes booked duration, it is not easy work to reach Belfast in 3 hrs. 10 min. With 178 tons No. 171, *Slieve Gullion* covered the 22¼ miles from Dundalk to Drogheda, crossing the Boyne viaduct near the latter station at reduced speed, in exactly 30 min. Thence to Dublin the 31¾ miles occupied 39 min., with good running throughout, reaching 60-65 miles an hour for several miles. With the 3 p.m. express, the hardest of the day, the writer was privileged to travel as far as Dundalk on the footplate of No. 174, *Carrantuohill*, the last of the Schmidt superheater class.

This engine had been in service only a few days, and Driver McGee and Fireman MacDonnell were not fully used to her or to superheater engines. Moreover, the run was made on July 11, so that we were handicapped by heavy and special traffic occasioned by the 12th of July celebrations in Belfast. The load consisted of 10 bogie coaches (well filled) and a six-wheeled van as far as Drogheda. Very nearly the same speeds were made from stage to stage as in the case of the down journey referred to, except that Drogheda was the first stop, and we reached that station in a few seconds over 40½ min. (31¾ miles), whereas 43 are allowed. With the Oldcastle coach off, the 22½ miles to Dundalk occupied 30½ min., the difficult start and adverse grades for a few miles being followed by smart running, touching 70 miles per hour past Dromin Junction and Castlebellingham. At Dundalk the load was reduced to 200 tons, and steady but not remarkable work was done over the severe gradients which rule past Adavoyle, the 17¾ miles to Goraghwood taking 31 min. Thence to Scarva took 11¾ min. (7¾ miles), and the following stage to Portadown (also 7¾ miles) occupied 12¼ min. These are start to stop stages, and in view of the difficult grades and the crowded train, the times given were decidedly good, though the driver did not press the engine as one of the big-ends was inclined to run hot. By this time, though excess time had been occupied at stations, we were only 4½ min. late; but at Portadown the special traffic threw us almost 10 min. behind. However, with a load increased to 280 tons, exact running time was made to Belfast on the fast schedule in force, 32 min. for 25 miles. The first few miles are difficult, but Lisburn (17¼ miles) was passed in 23 min., the remaining 7¾ miles, with a careful run into the terminus, taking 9 min.

Next day, the same engine worked the 7.30 a.m. breakfast car express, again loaded up by special traffic, every seat being occupied as far as Portadown, though the train was made up to the maximum, about 280 tons, and as long as the platform at Great Victoria Street would take. Lisburn was passed in 14 min. (mainly adverse gradients), and Portadown reached in 34 min. As the train then calls at Scarva,

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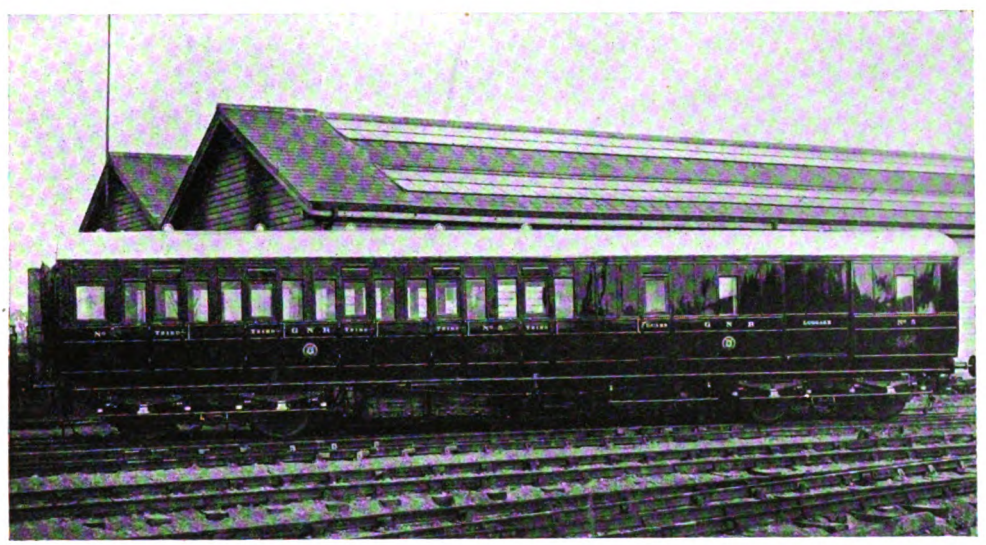
Goraghwood, Bessbrook and Adavoyle it is unnecessary to specify times to Dundalk in detail, especially as station delays and gradient difficulties caused the 33¼ miles to occupy 64 min., one min. in excess of allowance, but representing a gain of 3 min. against extra time spent at stations. The load over this stage was 178 tons. From Dundalk express working again came into force, and with the same load the 22½ miles to Drogheda were covered in 27¾ min. Two further vehicles were then attached, and with 230 tons No. 174 gave a splendid run, nearly compensating for the lateness due to special traffic, being momentarily stopped for signals outside Amiens Street station in 36 min. from Drogheda.

and the 8.20 p.m. 3 hrs. 50 min. to Belfast, but they are to all intents and purposes stopping trains over a large portion of the journey. Of the Sunday down trains, the 6 p.m. takes 3 hrs., with six stops. The 8.20 p.m. runs as on week-days.

Of the up trains from Belfast, the 7.30 a.m. has already received attention. The 9.55 a.m. takes 3 hrs. 10 min. with seven stops—this has been described between Dundalk and Dublin. The 2.20 p.m. reaches Dublin at 5.30 p.m., with seven stops. The Dining Car Limited Mail at 5 p.m. now reaches Dublin at 7.30 p.m., and a portion is conveyed through to Kingstown Pier. This is now booked to Portadown in 30 min. from Belfast, as well as having the



A MODERN COMPOSITE CARRIAGE AS USED FOR PRINCIPAL TRAINS: GREAT NORTHERN RAILWAY OF IRELAND.

These runs indicate more clearly than can be shown otherwise the quality of the work to be performed, and it must be remembered that the special traffic which applied when these journeys were made does not materially alter the usual conditions in summer, though it accounted for the trains being crowded and one or two vehicles heavier between Portadown and Belfast. The other principal express from Dublin to Belfast is the 6 p.m. dining car train. This is a heavy train and with stops at Drogheda (due in 40 min.), Dundalk, Goraghwood, Scarva, Portadown, Lurgan, and Lisburn, calls for very good work indeed. Of the other through trains, the 6.50 a.m. takes 3 hrs. 55 min., the 10.45 a.m. 4¼ hours, fastest schedules in force over other sections, but is rarely very heavy. The 5.45 p.m. express is the previous 5.30 accelerated, the arrival in Dublin being 8.55 p.m. as hitherto, although eight stops are included. The 10 p.m. is a slow night connection, with a sleeping car, but as it waits 2¾ hours at Portadown to connect with the 9.30 p.m. from Londonderry, it can hardly be called a practicable through train, though it has its usefulness. On Sundays the 3.20 p.m. is a tea car express in 3 hrs. 25 min., and the 10 p.m. runs as usual.

The English connections of the Limited Mail trains have been mentioned. The 9 a.m. express from Amiens Street has a connection from North Wall after arrival of the

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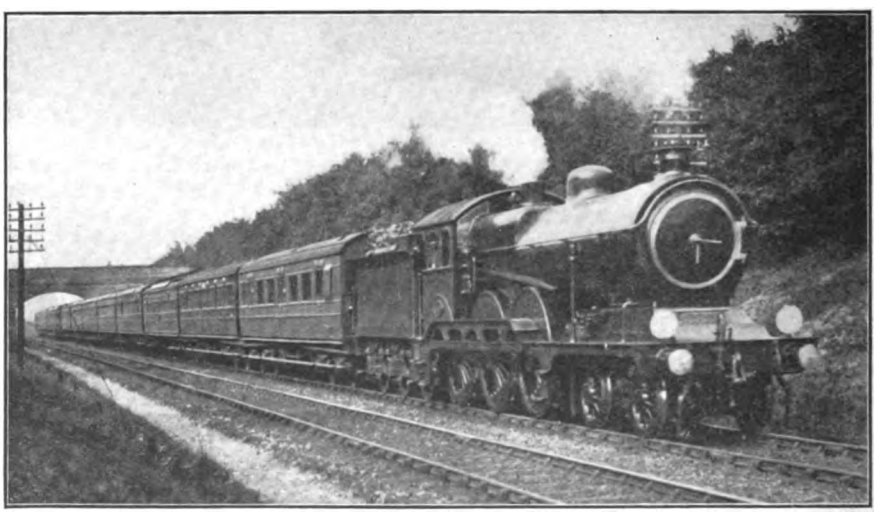
London and North Western Railway night steamer from Holyhead (Euston 10.15 p.m.), while the 6 p.m. dining car train is served from Kingstown at 5.10 p.m. by the day mail steamer from Holyhead (Euston 8.30 a.m.). The 9.55 a.m. express from Belfast has a through carriage for Kingstown for the London and North Western steamer to Holyhead (Euston arr. 11 p.m.), and the 5.45 p.m. train has a through carriage for North Wall for the London and North Western steamer which leaves at 9.20 p.m. Although all ordinary expresses call at Drogheda, Dundalk and Portadown longer runs are occasionally given to reliefs or special trains, as from Dublin to Dundalk or even from Belfast to Drogheda.

Modern rolling stock of the Great Northern Railway of Ireland is somewhat suggestive of that of its English namesake. Varnished mahogany is used for modern vehicles, and the lettering and numbering is very similar. Engines are painted the same shade of green, and the round-roof cabs and built up chimneys (cast iron chimneys are now replacing them) add to the sense of familiarity. Otherwise, however, the Irish Great Northern has its own characteristics of production. The goods engines are being painted black with a single red line similar to the North Eastern Railway. The set trains usually consist of clerestory roofed vehicles, but elliptical roofs are becoming general for new stock. Vestibuling and the inclusion of restaurant cars are being extended. We may also mention that Mr. Glover is taking advantage of the possibilities of the Irish gauge by including vehicles 9 ft. 6 in. wide. Upholstering and equipment, as well as the meals served in the restaurant cars, are quite up to English standards. A special excursion recently arranged from Belfast to Killarney may be mentioned, the day fare being 10s. 6d. Great Southern and Western corridor coaches were used. Killarney was reached at 7.30 a.m., the return journey beginning at 5 p.m., due to reach Belfast soon after midnight. About 640 passengers travelled by the excursion. For a small additional fee meals at Killarney were included, while other special arrangements were made for the benefit of visitors from the North.

Norfolk Coast Express: Great Eastern Railway.



Photo] [*F. E. Mackay.*

This summer, for the first time, the 4-6-0 (Schmidt superheater) engines are being used on the up and down Norfolk Coast expresses. The up train is shown above, drawn by No. 1510, one of the new locomotives of this class.

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The Lancashire and Yorkshire Railway and the Ghent International Exhibition.

THE Lancashire and Yorkshire Railway Company's stand at the Ghent Exhibition, constructed, as will be seen from the above photographic reproduction, on a very elaborate scale, is one of the finest railway advertisements in the British section. It is 44 ft. long, 20½ ft. high, and 10 ft. from back to front. The exhibits consist of: (1) model of s.s. *Ouse*, one of the latest boats in the large fleet of 23 steamers now engaged in the Goole and Continental service; (2) model of the turbine steamer *Duke of Cumberland*, in service between Fleetwood and Belfast; (3) model of the twin screw steamer *Colleen Bawn*, in service between Liverpool and Drogheda; (4) framed photographic views of places of resort and railway commercial subjects; and (5) a map, 15 ft. long, showing the Lancashire and Yorkshire system and its connections with Ireland and the Continent, exhibited on the back of the stand.

As will be observed, in addition to the framed photographic enlargements, two panels advertising the service from the Continent to England *viâ* Zeebrugge and Hull, and the various routes from the Continent to Goole, are displayed on the screen. The stand is in charge of an attendant who is capable of answering enquiries in both English and French, and of giving information affecting passenger and goods traffic by the company's routes from various ports to Goole and Hull.

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Birmingham Suburban Train Services of the Midland Railway.

By P. F. GROVES.

THE limits of the large suburban traffic carried by the Midland Railway in the neighbourhood of the "Capital of the Midlands," may be said to be Whitacre in the east, Barnt Green in the south, and Streetly, on the Walsall and Wolverhampton Branch, in the north-east, the company not having any lines running from Birmingham either west or north-west. Whitacre Junction is situate on the West of England main line, 10½ miles east of New Street station, Birmingham. The branch to Nuneaton and Leicester, and a single line branch to Hampton-in-Arden, on the London and North Western Railway line between Coventry and Birmingham, leave the main line at Whitacre. There is only one train per day in each direction over the last-mentioned branch, but the Leicester line has quite a good service. To Barnt Green, 10½ miles south of Birmingham by main line, there are two routes. The direct one is along the ordinary main line, but there is a line which leaves the main line a mile north of New Street station, and curves round sharply to the east, then to the south, rejoining the main line at King's Norton, a countrified but large and growing suburb of the Midland capital. By this route the distance to Barnt Green is 12½ miles, and the stations are Camp Hill, Brighton Road, Moseley, King's Heath, Hazelwell, Lifford, King's Norton and Northfield. By the main line the stations passed are Five Ways, Church Road, Somerset Road, Selly Oak, Bournville, King's Norton and Northfield, the routes being the same onwards from King's Norton.

Five Ways, Somerset Road and Selly Oak, and also Bournville, are served by 19 slow trains daily from New Street. Thirteen of these call at Church Road, an unimportant little station between Five Ways and Somerset Road. This station serves the wealthiest part of the city, but is very little used. There is also one train which does not call at Five Ways, making fourteen trains in all. The first and last down (from New Street) trains are respectively the 8 a.m. and 7.55 p.m. *ex*-Birmingham. In the other direction the first up and down trains leave Church Road respectively at 8.19 and 7.51 p.m. Selly Oak is served by three non-stops and a train calling only at Church Road from New Street in addition to the slow trains, and Bournville has six fast trains from Birmingham. On Saturdays there are two extra fast trains. The total number of trains daily calling at these stations is thus 19 at Five Ways and Somerset Road, 23 at Selly Oak, and 25 at Bournville. To all stations except Church Road, the first down train is the 5.25 a.m. workmen's train from New Street, and the last is the 11.5 p.m. from New Street. There are 20 slow trains to New Street, but only 10 of these serve Church Road. The first leaves Bournville at 6.34 a.m., the last at 11.3 p.m.; but at Somerset Road the last train is the 10.30 p.m., as the 11.3 p.m. from Bournville does not call. Besides the slow trains there are three "non-stops" to New Street from Selly Oak, and three fast trains from Bournville, the total number of trains thus being 20 from Five Ways, 18 (two of the slow trains not calling) from Somerset Road, and 23 from both Bournville and Selly Oak.

At Bournville are Messrs. Cadbury's enormous chocolate works. In and about these there are no less than 3½ miles of railways, with four engines. These latter, three of them saddle tanks, are painted respectively yellow, blue, green or red. One of these engines, "Bournville No. 4" was illustrated and described in the RAILWAY MAGAZINE, April, 1913, page 338. To Bournville there is a spur curving round sharply from Lifford station on the King's Heath loop-line. This curve, locally known as the "Lifford Curve," enables trains to start northwards from New Street *viâ* King's Heath, and return to New Street by the Lifford Curve and the main, or "West Suburban" line. Thus, four trains complete the circular journey, and another does so far as Selly Oak only, but five trains perform the whole journey in the reverse direction.

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The only remaining passenger train which uses the curve is one from Bournville to Birmingham only. Like all other lines herein mentioned, not stated to be otherwise, this curve is double.

All the stations on the West Suburban line as far as Bournville are closed on Sundays, and Selly Oak is the only one provided with goods accommodation. King's Norton, the next station to Bournville, is the starting and finishing station of the five trains which run over a single line branch to the little town of Halesowen, also served by the Great Western Railway, with which company this branch, 8½ miles long, is jointly owned. Three of the trains are mixed, King's Norton to Halesowen, two Halesowen to King's Norton, and the time taken on the journey varies from 26 to 31 minutes. Make-up of the mixed trains is usually as follows: 0–4–4 tank locomotive, three six-wheeled coaches, and four or five trucks with goods brake van. The junction with the main line is at a point a mile south of Northfield station, to which point from King's Norton there are four tracks. Fourteen slow and five more or less fast trains travel from New Street to King's Norton *viâ* Selly Oak in addition to three non-stops, eighteen slows, and two semi-fasts *viâ* Camp Hill.

The first train from New Street is the 5.25 a.m. workmen's *ex*-Birmingham, *viâ* Selly Oak, and the last arrives at 11.45 p.m., being a slow train *viâ* Camp Hill. It will be seen that there are 43 trains daily from New Street to King's Norton. Tram competition, however, takes much traffic from the railway, the fare by tram being only 2d., while by railway it is 5½d. Trams also provide a much cheaper means of getting to Bournville, Selly Oak, and Lifford, but the railway fare to the other places served by trams has been lowered to meet the competition. The Sunday service consists of one "non-stop" and nine "slows," *viâ* Camp Hill (one terminating). Six "non-stops" run daily to New Street, but there is an extra one on Mondays, and on Saturdays one of the "non-stops" calls at Lifford and Camp Hill. Twenty slow trains run *viâ* Camp Hill to New Street, and 18 *viâ* Five Ways, and there are four "semi-fasts" to New Street. The first of these up trains is the 6.26 a.m. slow to New Street, except on Mondays, when there is a non-stop train departing at 6.18 a.m., and the last train is the 10.58 p.m. from King's Norton. Splendid services are provided at times when the business men of the city travel to and from the city. Trains leave King's Norton for New Street at 7.43, 7.58, 8.5, 8.23, 8.30, 8.35, 8.55, 9.2, 9.13, and 10.2 a.m., and again at mid-day, at 1.32 (except Saturdays), 1.40, 1.46, 2.3, 2.28, and 2.39 (Saturdays only). In the opposite direction there are eight trains from New Street between noon and 2 p.m., and nine between 4.30 and 7 p.m., which is a very liberal service.

Northfield, 1¼ miles further south, has

KINGS NORTON STATION: MIDLAND RAILWAY.

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one " non-stop " from New Street, occupying 15 minutes on the journey. There are seven trains calling at only one or two stations *en route*, and three " slows " *viâ* Five Ways, and seven *viâ* Camp Hill, also one train calling at Camp Hill, Lifford, and King's Norton only. Several extra trains run on Saturdays. There are also the five Halesowen branch trains, which provide extra services for passengers who care to change at King's Norton, though one of them is a through train from New Street. Excluding Halesowen trains, there are 18 trains from New Street daily, and there is no tram competition. The first down train arrives at 7 from New Street, and the last at 11.18 p.m.; but on Thursdays and Saturdays the 11.20 p.m. slow from New Street is extended beyond King's Norton, arriving at Northfield at 11.49 p.m. There are no " non-stops " to New Street, but six fast trains, seven " slows " *viâ* Camp Hill, and five *viâ* Five Ways, with extra trains on various days of the week. The first of these 18 up trains leaves at 6.22 a.m. (Mondays 6.13), and the last at 10.12 p.m. (Thursdays and Saturdays three-quarters of an hour later). In addition to the 18 down trains serving Northfield, which also serve Barnt Green, the latter station is also served by five " non-stops " and a fast train calling at Bournville only, and various extra trains on Saturdays. There are three " non-stops " from Barnt Green to Birmingham, occupying 19 or 20 minutes on the 10½ mile journey. Besides ten slow trains, four of which run *viâ* Five Ways (the rest going by way of King's Heath), there are 10 fast trains, making a total of 23 trains to Birmingham from Barnt Green, exclusive of extra trains on certain days.

The only stations remaining to be considered are those on the King's Heath loop line. Camp Hill, the first of these out of New Street, is three miles distant from the latter station, as the line, as stated, runs northwards for some distance, before curving to the southward. There are 23 trains to Camp Hill from New Street, but as this station is situate in a poor part of the city, it is used chiefly by workmen. A large number of the pupils attending the grammar school of King Edward VI. near the station also travel to it. A considerable number of season tickets are held by the scholars of the King Edward VI. High School, Birmingham, which adjoins New Street station. There are 25 up trains, the first and last of which are the 6.43 a.m. and 10.35 p.m. respectively. The first and last down trains are the 6.35 a.m. and 11.20 p.m. These trains are also the first and last ones at Moseley, King's Heath, and Hazelwell. All the down trains to Camp Hill, except the first two in the morning and the 1.55 p.m. *ex*-New Street, call at Brighton Road, ¼-mile further south than Camp Hill. The first down train is the 8.10 a.m. *ex*-New Street, but all others are the same as at Camp Hill, except the above-mentioned 1.55 train. Moseley, King's Heath and Hazelwell have 24 down trains, and respectively 24, 25, and 23 up trains. There are 21 trains per day from New Street to Lifford. All on this line, except one in each direction, are slow, and all but five of the down trains go to King's Norton or beyond. The five which do not do so are those that go round the Lifford curve to stations on the Selly Oak, or " West Suburban " line. Twenty-three up trains leave Lifford for Birmingham, the first being at 7.12 a.m., and the last at 9.33 p.m. All but two of these call at each station. The first down train leaves Lifford at 6.50 a.m. and the last at 10.6 p.m.

The gradients from New Street to Moseley, and also from New Street to Church Road are very steep. There are two principal goods stations. One of these is in Lawley Street, and is connected with the main line by a branch meeting it near Saltley station, a mile north of New Street. There is also a branch, upon which is one of the very few level crossings in the district, connecting the goods station with the Camp Hill line. This joins the Camp Hill line at St. Andrew's Junction box, where a curve leading to the Great Western Railway's large Small Heath goods yard diverges from the Camp Hill line. The Great Western Railway is crossed between St. Andrew's box and Camp Hill station. The other Midland goods station, at Worcester Wharf, is reached by a branch line leaving the main line immediately north of Church Road station, and running parallel with, but on a higher level than the main line till just past Five Ways station, which it passes at the back. This station has for many years deservedly won the prize given for the best station garden, as although it is one of the dingiest stations known to the writer, in the summer it never fails to look gay with its floral adornments, which are at their best on the embankment of the Worcester Wharf Goods Branch, which, as I have stated, runs at the back of the station.

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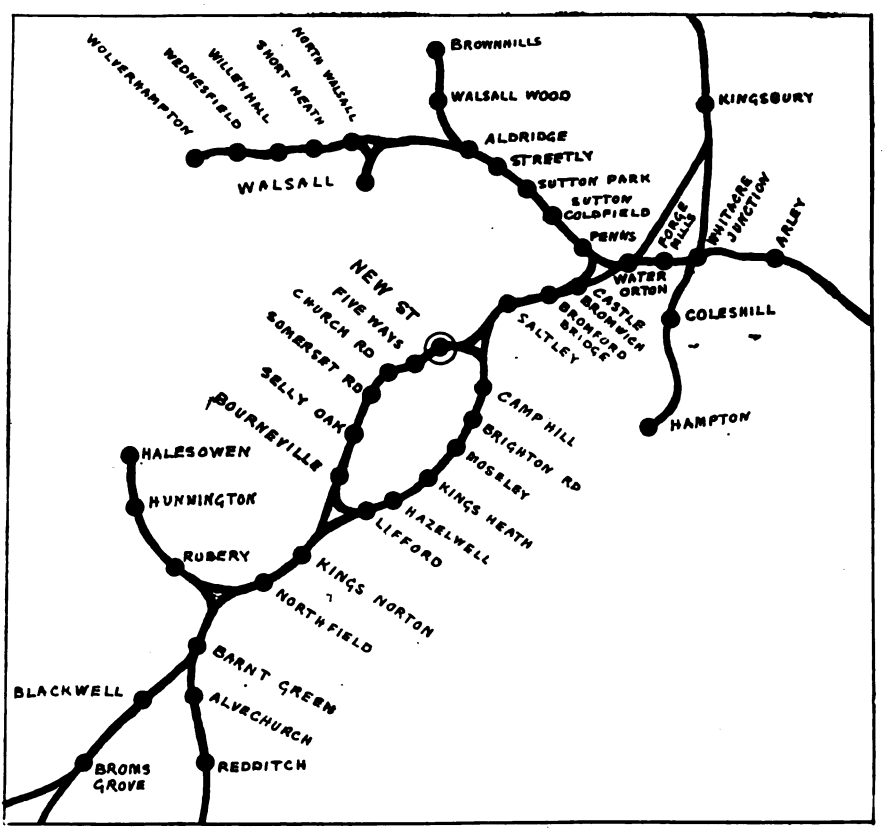
Out of Birmingham in the northerly direction, the first station to be considered is Castle Bromwich. There are two intermediate stations, but Saltley is used mainly by workmen, being in the "east end" of the city, and Bromford Bridge, the other, is only used when the Birmingham races are in progress. Eleven main line slow trains call at Castle Bromwich from New Street, but there are in all 25 up trains calling at the station, as the 14 trains from New Street to the Wolverhampton Branch also call. Ten down main down do so on Sundays. The first and last up trains are the 7.38 a.m. and 11.10 p.m. *ex*-New Street; down are the 6.49 a m. and 10.51 p.m. from Penns. From Castle Bromwich the first and last trains are as follows:—Up, 6.30 a.m. and 11.10 p.m. *ex*-New Street; down, 6.57 a.m. and 10.20 p.m. (10.59 p.m. on Saturdays). One train, leaving Walsall at 7.45 a.m., terminates at Penns, and returns to Walsall at 8.35 a.m. after waiting 23 minutes. Sutton Coldfield is the next station, but, as it is served by



THE MIDLAND RAILWAY IN THE BIRMINGHAM DISTRICT.

line slow trains call, and 13 branch trains bring the total number of trains up to 23. All except one in each direction call at Saltley. The Wolverhampton line leaves the main line about 500 yards north of Castle Bromwich station. As far as the junction, from Saltley there are four lines of rail, but elsewhere there are only two. Castle Bromwich station is closed on Sundays. Penns, on the Wolverhampton line, is the next station. Thirteen up and 14 down trains call, and five up and four a very much more frequent service of London and North Western Railway trains over a route 3¼ miles shorter, the lion's share of the traffic naturally falls to this line. The Sunday service consists of five trains. The first train from New Street is the 6.30 a.m., and the last the 11.10 p.m. Down trains are the same as at Penns.

The next station, Sutton Park, is in the middle of a large public pleasure park in which stands a miniature railway. The 11.10 p.m. train from New Street does not

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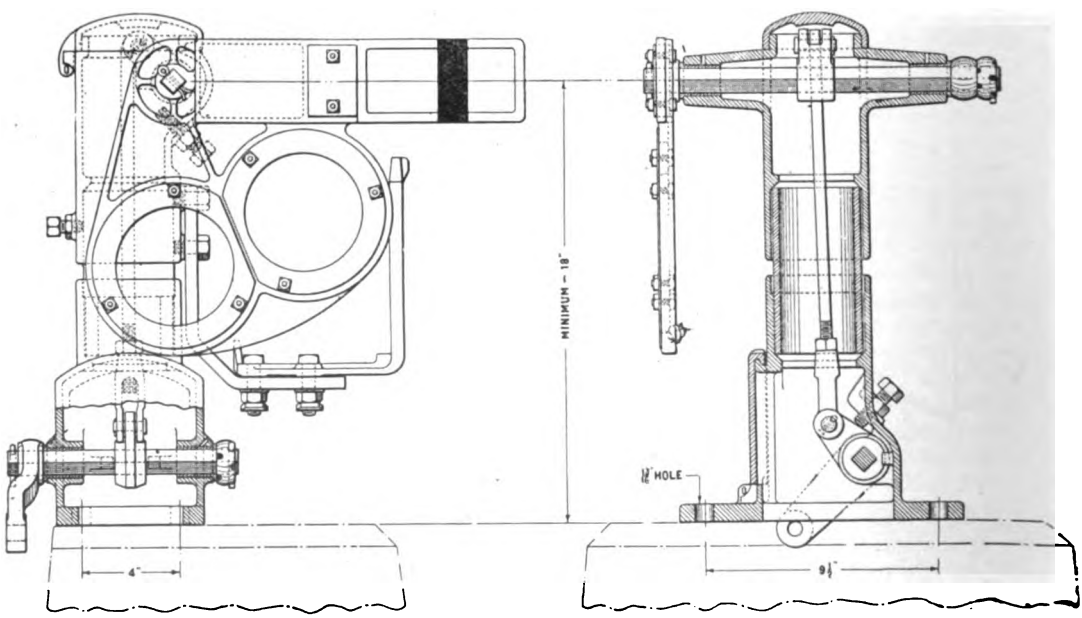
call, the last up train being the 9.50 p.m. from New Street, otherwise the up service is the same as at Sutton Coldfield. The first and last down trains are respectively, the 7.28 a.m. and 9.1 p.m. One train—the 6.20 p.m. from Walsall—terminates at Sutton Park. The service in both directions at Streetly, the next station, is the same as at Sutton Coldfield, with the addition of the train terminating at Sutton Park.

Several of the Birmingham stations are very close together. A tube railway, or subway, to connect them, and various other schemes have been talked of, but as yet nothing has come of them. The stations on the Halesowen branch are called Rubery and Hunnington, there being a passing place at the former. Between these two stations there is a goods siding serving the Birmingham waterworks at Frankley. On the Hampton branch the only intermediate station is Coleshill, and the line is single, though traces of a second track still exist, for as readers of the RAILWAY MAGAZINE know, the branch was once used by the Scotch expresses, which ran from Hampton to London over the London and North Western Railway until the Midland Company opened a line to London. The service is worked by a four-compartment composite-brake coach, with a smoking and ordinary compartment of each class. On the occasion when the writer travelled over the line the engine was No. 3696, a 0–6–0 goods locomotive, which seemed to have no difficulty in hauling the one coach, as it made up three minutes on the 15 minutes timing allowed. Goods accommodation is provided at Coleshill.

Dwarf Signals on American Railways.



For " slow-speed " train movements, as well as for shunting, dwarf semaphore signals are largely employed on American railways, and we illustrate above a new standard design introduced by the General Railway Signal Company of Rochester, N.Y., U.S.A. The blade is 18 in. above ground level and about 12 in. above the rails. It is arranged to move upwardly to give the " clear " indication, so as to agree with " upper quadrant " signalling. There is no counterweight or spring, and the mechanism is enclosed within the hollow pillar.

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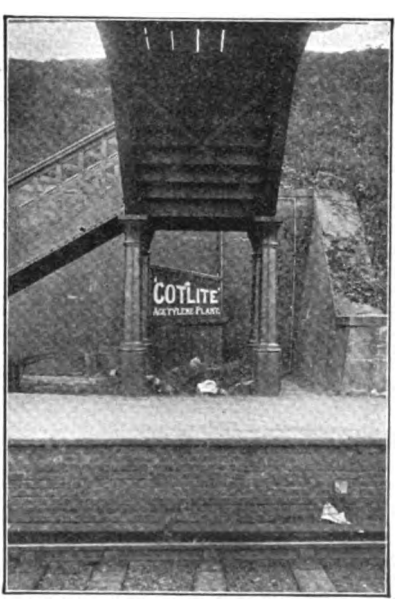
Acetylene Lighting at Robertsbridge Station, South Eastern and Chatham Railway.

REAR OF SIGNAL CABIN, SHOWING "COTLITE" GENERATORS: ROBERTSBRIDGE STATION, S. E. & C. R.

AS it is the junction for the Kent and East Sussex Railway, and ranks as an important station on the Hastings branch of the South Eastern and Chatham Railway, the lighting demands at Robertsbridge are considerably heavier than they would be at an ordinary roadside station. Therefore, the installation of acetylene lighting on a new system—known as the "Cotlite," devised by the Cottage Lighting Company, of Robertsbridge—affords a good test as to working capabilities and economic results on a scale which satisfies the conditions applying to most railway stations of a secondary order. In the case of larger stations it is usually found convenient to obtain gas from local companies, or to instal lighting apparatus on a more extensive scale than is called for at wayside stations. But while the demands at Robertsbridge are heavy enough to constitute a good test as to the efficiency of the "Cotlite" installation, it is a simple process to develop the plant considerably before it reaches the stage where installations of a different character become desirable.



THE "COTLITE" PLANT SERVING THE UP PLATFORM AT ROBERTSBRIDGE STATION, S. E. & C. R.

At Robertsbridge there are two generating plants—one in a small case placed under the supports for the overhead footbridge on the up side, the other in a case built at the rear of the signal box and supplying the down platform, station buildings and overbridge. The latter plant consists of one "Cotlite" S-type plant with four generators coupled in pairs, while on the up side one "Cotlite" S.C. plant having two single generators is found sufficient. Altogether there are 50 lights, each of 25-candle power, run from the two plants. All the generators are interchangeable, each holding 6 lbs. of calcium carbide, and producing 30 cubic ft. of acetylene. A communicating pipe and valve allows either plant supplying the whole station to meet a temporary emergency. The office lamps and those for lighting the goods yard burn about 1 cubic ft. of gas per hour, but those on the platforms and for general use consume only half this amount, while a few burners are reduced to one-third of a cubic ft. per hour.

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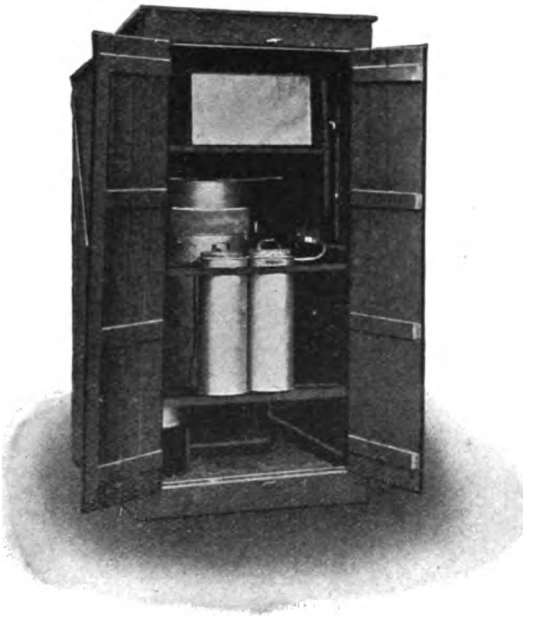
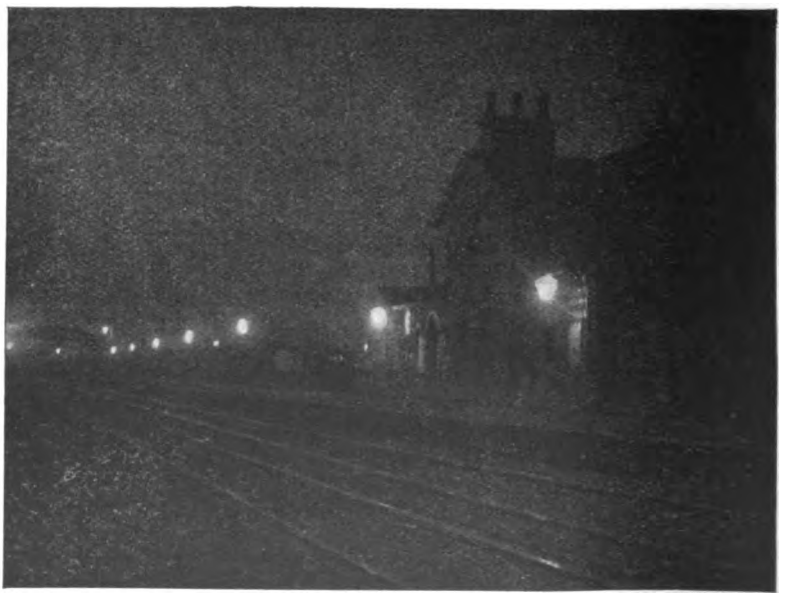


"COTLITE" 20 LIGHT (TYPE S. C.) GENERATING SET.

The plant at Robertsbridge Station is enclosed in an ordinary wood case, double thickness, with an air space between the inner and outer casing to protect from frost, and as these cases are fully opened when attendance to the plant is required, the risk of accident from the accumulation of gas is eliminated. Portable generators or carbide containers, the special feature of the "Cotlite" apparatus, are recharged at the Cottage Lighting Company's carbide Stores adjoining the station premises, and kept in the plant case for use as required. Owing to the peculiar construction of these generators or carbide containers, there is no wastage of carbide, and as a generator cannot be exchanged without closing an interlocking tap, the exchange is safe in the hands of an ordinary porter.

The plant is mainly of an experimental character, in that it is designed to give the "Cotlite" apparatus a trial under working conditions, and also to enable economic aspects to be ascertained. The installation has now been running nearly two years, which is a period amply sufficient to arrive at fairly reliable data.

It has been found that when tested against the old oil lamps as used for platform lighting a ½ candle-power burner gave, on photometric test, four times the effective light. The whole of the lights are fitted with separate bye-pass taps, and the total consumption of gas per hour for 12 lamps when turned down is about 1 c.f., or 1-12 c.f., per lamp hour. Recent tests made in the presence of the Railway Company's engineers, show that, when the whole station is fully lighted, the cost of carbide is in round figures, sixpence per hour, taking carbide at 14s. per cwt. at Robertsbridge, and a trial made with 20 lights turned down showed the consumption of gas for 20 lights to be only about 1½ c.f. per hour, costing, say, one halfpenny. When it is taken into consideration that with oil illumination at country stations, the lamps are lighted before the first train after dusk and burnt till after the last train at night, the saving effected by being able to turn them down between trains is very marked. It may be added that, in order to fully test the system of portable generators, the Cottage Lighting Company put in a



AN "UNTOUCHED" NIGHT PHOTOGRAPH, SHOWING ACETYLENE LIGHTING ("COTLITE" SYSTEM) AT ROBERTSBRIDGE, S. E. & C. R.

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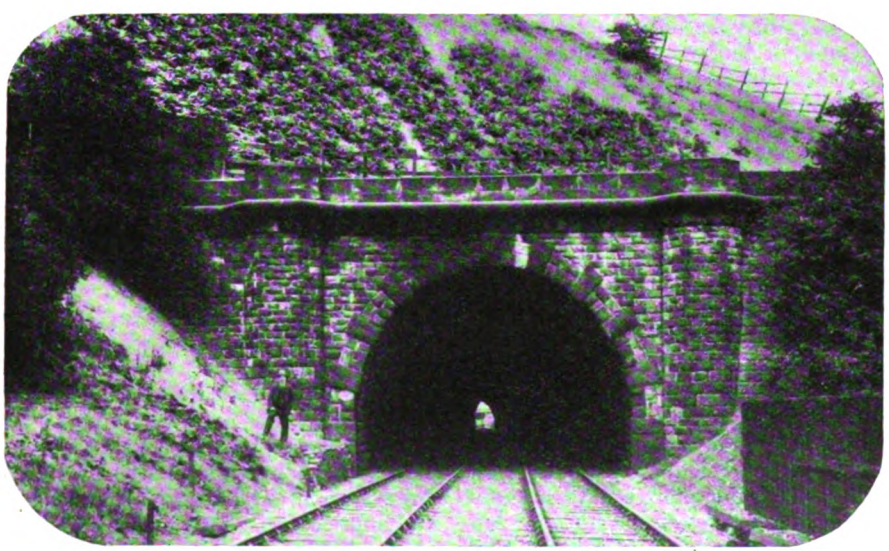
number of trial private installations, and refilled the users' generators for them. Some 5,000 have been so refilled, and, apart from the absence of accident, no intimation has ever been made that there was a smell of escaping gas, though the charged generators were often stored for a considerable period in confined places.

By sending charged generators, which are sealed at the carbide store and are returned with the spent material, a close check can be kept against waste. In addition there is no mess at the station itself. The only point to be settled was whether such a method of distribution was safe. After the three years' experience of the Cottage Lighting Company, safety has been fairly proved. The special feature of all "Cotlite" apparatus is, that the carbide containers are recharged at the carbide store—the handling of the carbide being under proper control—and not at the generating plant. Generators can be recharged in daylight, and stored for use in absolute safety until required. These are simply dropped into the generator tanks as required like a cartridge into a gun. The generators are usually mounted in twos or fours, fitted in crates so that they may be easily taken out or replaced. The same principle of portable charges is adoped to flare lamps, street lamps, wall lamps, and in fact any of the purposes for which acetylene is specially suited.

Where is this Railway Tunnel?



The photograph reproduced above was taken by Mr. W. W. Hollis, of Stafford, several of whose tunnel views have appeared in the RAILWAY MAGAZINE. The tunnel depicted is on an important main line in England, and we shall be pleased to hear from readers who can identify its location.

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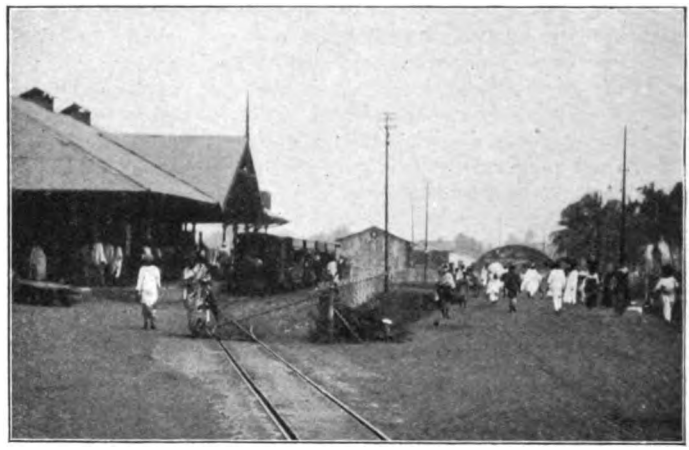
Travelling by Railway in Nigeria.

By RICHARD ARNOLD.



THE ROAD APPROACH TO IDDO STATION, SHOWING STEAM TRAIN.

A VERY few years ago Northern Nigeria was unheard of as a British Colony. Now it has an express boat train, with sleeping accommodation and restaurant car, running through weekly from Lagos, in Southern Nigeria, to Zaria and *vice versa*—a distance of roughly 650 miles—performing the journey in by no means bad time when one considers the roughness of the track in some places, that the whole distance is single line, that there are perforce long waits, and that little travelling is done in the night. Zaria is left at daybreak on Tuesday morning, and one wakes up at daybreak on Thursday to find the train actually alongside the steamer at the wharf in Iddo, where it has arrived in the very early hours of the morning.

Previous to September last this boat train did not run beyond Minna, which is about 150 miles south of Zaria, and is the junction between what were the Baro-Kano Railway and the Lagos Government Railway and also the northern terminus of the latter. Both railways are now, or very shortly will be, under one management as "The Nigerian Railways," and, looking forward a few years to the time when the great bridge over the Niger at Jebba is completed and the harbour at Lagos opened to the mail steamers—both of which are hoped for in about four years—one will see the advantage of the fusion of interests and the immense possibilities of a line nearly 700 miles in length, reaching from the seaport to our northern boundary, the northern terminus being at Kano, about 50 miles north of Zaria.

Zaria is the northern terminus of the boat train, and being important on account of the junction there with the Bauchi Light Railway, a few words about the town may not be out of place. It is a new as well as an old town—new as far as we are concerned, old, very old with the natives. It is situated on a vast plain, which must be of fair altitude, and although extremely hot, not so unhealthy as many or most of the towns. During the dry season beginning about the end of October, there is often a wind blowing off the Sahara, bringing with it quantities of fine sand. This is known as the "Harmitan," and, while it lasts, the surrounding country presents the appearance of being under a slight mist or haze. The European population is rapidly growing, no doubt because Zaria is in most cases the last link with civilization, or shall I say, the market town for the staffs of the many mining companies now operating in the Bauchi district. The bungalows are new and well spread over a large area, and there is also a garrison depôt. An ancient wall spreads itself around all with a circle of some seven or eight miles and the native houses are dotted about in groups near this, so separate as to appear more like a series of villages.

Zaria station is built on the island platform system, and very substantial stone buildings comprise the various offices on the platform level, while a second storey above the station roof serves as the bungalow of one of the white officials. It is surrounded by a balcony, from which a very fine view of the line and the country around is obtainable. Being the junction for the Bauchi Light Railway, you can imagine that just now the staff is kept busy with a constant stream of goods of all kinds going through to the tin mines. The Bauchi Light Railway is of 2 ft. 6 in. gauge, but there is little else to remind one of its lightness. The engines are of the 0-6-2 pattern, with six-wheeled tenders.

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Beyond the fact that necessarily most of the motion is outside the frame, and that the driving wheels are exceptionally heavily weighted, there is little to distinguish them from the old Great Eastern goods engines, for they are painted the same blue, and have the straight funnel now virtually peculiar to the Great Eastern.

There are no passenger carriages, but the first-class passenger travels in a van with sliding door, similar to a covered goods van in England. It must be remembered that generally speaking one is moving about with all one's worldly possessions, and into this van goes bed, food and everything else. One generally makes the journey with a companion, in which case you put out your camp tables and share meals and refreshment, though you may probably never meet again, for there is no travelling hundreds of miles there without speaking to your travelling companions as we do at home. The natives, who by the way travel in such numbers that one wonders how they got on before the advent of the railway, are accommodated in an open goods truck round which is a lattice, something like that used when vegetables are piled into a truck in Great Britain. All the rolling stock is on the bogie principle.

On the west side of Zaria station is the main line, with five sets of rails beyond for shunting operations, and at the south end the platform is inset with a terminal set of rails. This bay was originally used for the transfer of goods from the main line vehicles to those of the Bauchi line, but the shed which stood there has been removed, and is now often used to stable the boat train, which spends Sundays and Mondays at Zaria. On the east side of the station are the rails of the Bauchi Light Railway, beyond the platform rails being several well devised bays and covered goods sheds, with arrangements for trans-shipping goods with as small an output of energy as possible—a very important matter with a native labour force to depend upon. At the north end of the station there are repairing sheds and engine accommodation. There is necessarily a large white staff here, and the travellers and strangers in the land owe them much for advice and many kindnesses.

On the Baro-Kano Railway, with the exception of the boat express, all trains are mixed traffic, and, although the time tables show only three trains a week between Minna and the North, so great is the pressure at present that a day seldom goes by without one at least proceeding as far as Zaria. These are, of course, specials, and cannot be relied upon, but if any first-class travellers should be waiting, the officials at Minna always oblige, if possible, by attaching a passenger coach. These coaches are peculiarly adapted to the conditions of travel, and are therefore worth a short description. They are long bogie coaches, with a clerestory roof and the usual sun and insect shutters on all the windows. At each end of the coach is a small kitchen compartment fitted with stove, etc., for the passengers' servants to cook meals in, and at one end next to this, lavatory, etc., though water is a luxury and has to be obtained when and where possible by your boy. The rest of the coach comprises five compartments, each about 7 ft. square, with absolutely no fittings. Into this you take all your worldly belongings and here you live until your journey finishes. At night it is a tight fit to get your bed across the car, but one has the consolation of a quiet sleep, for the trains do no travelling by night. You are able to pack away the bed before the journey is recommenced in the morning, and during the day one has ample room to have one's meals, or to lounge. A small door in the corner of each compartment gives access to the rest of the car, and enables those in the inner rooms to obtain their meals from the kitchens, without the necessity of waiting until the train stops.

THE BRIDGE—THREE-QUARTERS OF A MILE LONG—CONNECTING IDDO AND LAGOS WITH THE NARROW-GAUGE STEAM TRAIN.

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EBUTE METTA: CARRIAGE SHED AND PART OF YARD.

Some idea of the roughness of the track may be guessed, when I say that travelling between Minna and Zaria by ordinary train, I was having breakfast on my camp table, and although probably not running more than 12 or 15 miles an hour, the coach rocked so much that the whole of my breakfast, with the exception of my bacon and eggs, which could not be replaced and to which I clung desperately, landed at one slide on the floor and from the floor I had to take my tea and biscuits and marmalade for the rest of that meal. Having given the reader a few glimpses of the rough and ready way one has to be prepared to travel in the ordinary course of events, it will not be out of place to submit a short account of the most luxurious railway journey one can make out there, that is from Zaria to Lagos (Iddo) by boat train express. Before starting on the journey, a description of the train will show that it is by no means a light one for so rough a road. Next to the engine is a very long bogie luggage van, used exclusively for passengers' luggage, which, it must be remembered, cannot be kept down to the limited quantity to which one is accustomed in England; and it should also be mentioned that everything over 3 cwt. has to be paid for, so that a considerable revenue must be derived from this source.

The next vehicle is a long bogie first-class coach, attached for the convenience of the staff of the railway going on and coming from leave, there being always a goodly number of engine drivers, smiths, guards and others making the journey. Then follow the two "sleepers." They are entered from the ends, and have the following accommodation. From the entrance, on one side, two long seats or coaches, each of which pulls out and lets down the back, making a bed double the width of the seat; on the other side of the car two pairs of single seats facing one another, with two small tables between. The tables fall down, and the seats pull out to meet one another, making two more beds. You then pass into a side corridor, opening from which there is the lavatory and bath room and two cabins, much as our corridor compartments are, except that the folding table is there, and that two upper bunks come down on a hinge. Then there is the second lavatory and bath-room, and the further end of the car is the same as the former. During the day the bedding is stowed away, and the open ends of the cars become the sitting and smoking-rooms. After these follow the restaurant and kitchen car, which is about equally divided as to kitchen and pantry room and dining accommodation. The latter has not been made the most of, as there are six tables with seating for two only at each, whereas four could be easily accommodated, as the car is wide and roomy. If necessary a second meal is served, or the overflow provided for at the tables in the sleeping car. A white steward is in charge of the catering and management, his cooks and assistants, of course, all being natives. A stores car with refrigerator is next, followed by a third-class car for passengers' servants, in which there is a small post office compartment in charge of a native official, and finally comes the guards' van, where live the white guard and the steward.

All the stock composing the train are substantially built bogie vehicles. We were due to leave Zaria at 5.30 in the morning (Tuesday). So we were on board overnight, and made acquaintance with our rather hard couches in the peace and quiet. Early on Tuesday morning, as the first signs of daylight were making their appearance, when lying awake wondering how soon I might get the early morning cup of tea, I could not help hearing, going on between our engine driver and a friend, a conversation which finished much in this fashion:—"Well, good-bye, Bill, I suppose I'll see you next Tuesday. It's gone the half, so I'd better be off." Without more ado we started on our run of over 600 miles, and I could not help comparing such quiet and easy-going conditions with the bustle and noise to be found at any of our great termini at home. Our engine was named "Emir of Katsena" and was of the 4-8-0 class with

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bogie-tender, belonging to the Baro-Kano Railway. The first portion of the day's run is over the plains which surround Zaria, and where are to be seen countless little plots of guinea corn farmed by the natives. But after passing Koduna, about five hours from the start, the country changes, and the track begins to wind up and down. We then pass between some very stately hills, one very high hill in particular, apparently solid stone of the rounded block kind seen in Devon and Cornwall, attracts attention and comes sheer down to the very edge of the permanent way.

Minna is reached at 3.50 p.m., after an uninterrupted run, except for taking water, of about 150 miles. Here about 15 minutes is allowed, and one is glad of the opportunity to stretch oneself and get a breath of fresh air, hot though it be. A change of engines is made, and No. 203 of the Lagos Government Railway, a 2-6-2 with bogie tender, was attached to our train. We started from Minna a few minutes after 4 p.m., and almost as soon as the station is quitted the line to Baro leaves us on the left or eastern side. Hereabouts the scenery is uninteresting, and we were glad to find comfort in a cup of afternoon tea. The track now appeared to be a much better one; indeed for the remainder of the journey it was so, and at times quite a good speed was attained. Just as one was beginning to think of dinner (namely at 6.45 p.m.) Zungeru was reached, and a further break of about fifteen minutes was obtained, while the engine was changed to another of the same class. Without exception, all the passengers here I think met friends, and quite a reception was held on the platform, the window of the restaurant car serving as buffet. Seven o'clock saw us off again and sitting down to dinner almost immediately. A pleasant chat followed, and we all turned in early, to be roused at dawn with a cup of tea and warnings to dress quickly.

We were now on a side line beside the river Niger at North Jebba, where we had arrived shortly after midnight, after a run of about 122 miles from Zungeru. Here there is plenty to see besides fine scenery and a wonderful river, for soon all is bustle in connection with the big works for the bridge now under construction. About five huge piers towering up out of the water on the north side appear to be more or less in a finished state, while work was proceeding on the remainder. A temporary pier on which was a crane, appeared to have been undermined owing to the swiftness of the current, and the crane had been left standing at a most alarming angle. Our train had to be ferried across the river, and we were warned that it was safer to walk on to the ferry than remain in the cars. We were about 40 ft. above the river, and one by one the coaches were detached, afterwards to be attached to a wire rope, running over drums, and controlled by a stationary engine, which let them down a short and steep incline on to the ferry steamer. The first trip across left at 6 a.m. (Wednesday) with guard's van, third-class coach, store car and dining car, and the ferry arrived back again for the remainder in exactly one hour. We got safely on board and across, but had some little difficulty in making fast to the south bank, so that the rails could be adjusted to those on shore. The reverse process was then gone through. Each coach was hauled up the incline from the ferry by the wire rope, and the whole train was eventually formed again in South Jebba station about 300 yards from the river. It will be noticed that no engine was taken across.

After much shunting, our train was once more in order. We now had engine No. 205 of the Lagos Government Railway, still of the 2-6-2 class, but with six-wheeled tender, as our tractor. We left South Jebba at 9.15 a.m. for the second stage of the journey, and hunger drove us at once to our belated breakfast. Extra traffic caused us to make one or two short stops at out-of-the-way stations for crossing purposes, and after an uneventful run we reached Ilarin, 60 miles from South Jebba, shortly after midday, a stop being made sufficiently long only to change engines once more. The next run is to Ibadan—roughly 124 miles—and during the restful hours of the afternoon we found the nature of the country through which we were passing changing to the thick bush which is found mostly in the south and in the coast district. Another change of engines was made here, and the journey resumed immediately. During the evening and in the night we appeared to be travelling at a great pace, and one thought of the "wash-outs" and "slides," wondering if we were destined to meet any of these in the dark. However, we woke at dawn to that welcome smell which is always associated with landing stages. We had arrived on the wharf at Iddo (opposite Lagos on the lagoon) about 2 a.m. Thursday, the last run of our journey from Ibadan being 125 miles.

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The Irish Traffic of the London and North Western Railway.

LONDON AND NORTH WESTERN RAILWAY HOTEL: NORTH WALL, DUBLIN.

HOLYHEAD has been described as "The Gateway to the Emerald Isle," seeing that so large a proportion of the Anglo-Irish traffic passes that way, either *viâ* Kingstown, North Wall (Dublin) or Greenore. But besides conveying a considerable proportion of the traffic *viâ* Holyhead—in fact, all except that taken by the City of Dublin Steam Packet Company's boats—the London and North Western is also jointly concerned in the Fleetwood and Belfast and Stranraer and Larne services, while in England a large share of the railway connections is provided by the North Western Company. *Viâ* Holyhead and Kingstown the City of Dublin Steam Packet Company works the morning and night mail services as regards the steamer crossings, though the London and North Western Railway supplies the splendid vestibuled restaurant or sleeping car trains in connection on the English side. The mid-day and the late night services both ways are worked by the London and North Western Railway throughout, except for the short run by Dublin and South Eastern Railway between Kingstown Pier and Westland Row (Dublin) in the case of the mid-day services (1.20 p.m. *ex*-Euston and 1.10 p.m. *ex*-Westland Row).

The Greenore route is exclusively North Western, the turbine steamer *Greenore*, illustrated in our last issue, being engaged on this service. *Viâ* Fleetwood the London and North Western Company provides special boat trains from London, while the Lancashire and Yorkshire Company supplies similar trains from north-country towns; and the steamers are jointly owned by these two railways. The London and North Western Railway is also a party to the Stranraer and Larne service—shortest sea passage—and provides through carriages and sleeping cars between London and other centres and Stranraer. In addition, cargo boats cross between Dublin and Holyhead, in some cases taking third-class passengers; but for general purposes the services specified are amply sufficient for all ordinary requirements, there being four each way daily between Holyhead and Kingstown or Dublin, and one each on the other services. On the Irish side the railway arrangements are distinctly good, the Great Northern and Great Southern and Western mail trains for Belfast and Cork respectively connecting with the boats at Kingstown in the case of the night mail services, while other services have connecting trains or through carriages to or from the principal Irish systems at Kingstown or North Wall.

But North Western associations with Ireland go much beyond the steamer crossings and the English train services. There are, of course, numerous through booking facilities, both excursion and ordinary, with break of journey, alternative route and other conveniences, besides a wide assortment of circular tour and other tourist arrangements. Tours are also arranged, including accommodation at the North Wall Hotel in Dublin. Passengers booked through to and from Ireland are also allowed to travel by the Limited Mail trains, and this covers third-class travel. In addition, the London and North Western Railway has its own station at North Wall, Dublin, and a first-class hotel adjacent thereto; while the Greenore Hotel and golf links, and the Dundalk, Newry and Greenore Railway, are North

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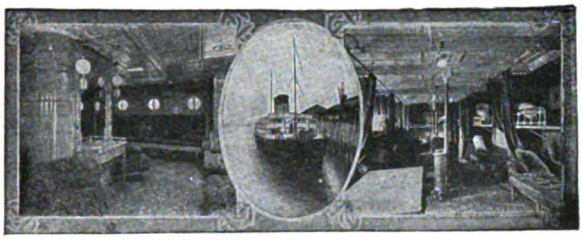
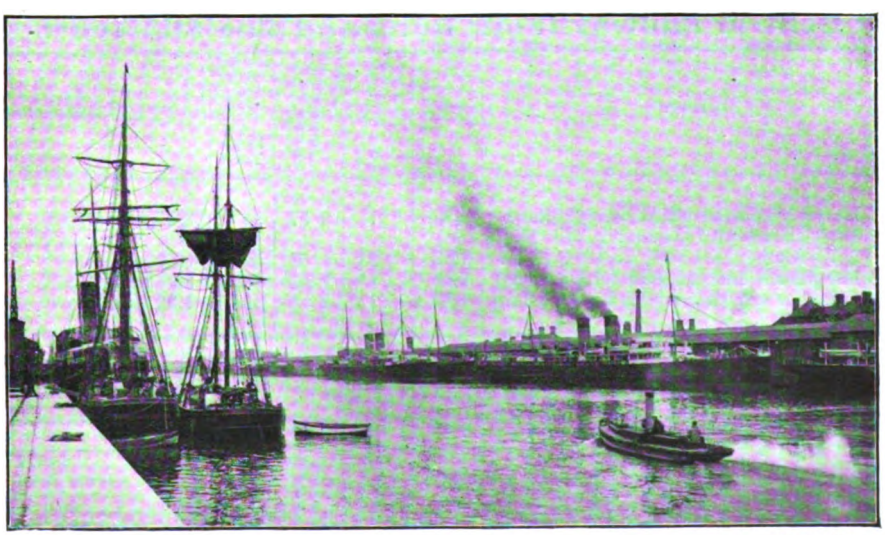


Ladies' Deck Cabin. Ladies' Cabin.

LONDON AND NORTH WESTERN RAILWAY: S.S. *Anglia*, ENGAGED IN HOLYHEAD–DUBLIN SERVICES.

Western property, though the railway is operated as a distinct concern. The engines and vehicles on this line are distinctively North Western as regards colours, decoration, and upholstering, the former being in fact characteristic Crewe-built saddle-tank engines adapted to run on the Irish gauge of 5 ft. 3 in.

The four London and North Western boats on the Holyhead-Kingstown or North Wall service, each of which will accommodate 1,200 passengers, are 340 ft. in length and 39 ft. in breadth, with a speed of 22 knots. They are sister ships named the *Scotia*, *Anglia*, *Hibernia*, and *Cambria*, and are equipped with wireless telegraphy. The North Western fleet consists in all of 18 steamships, and the company are part owners of 14 others. The vessels of the City of Dublin Steam Packet Company are 372 ft. in length, 41½ ft. in breadth, and can travel at a speed of 24 knots. They are named after the Irish provinces, *Ulster*, *Leinster*, *Munster*, and *Connaught*. As a rule, all tickets, except certain excursion and other arrangements, are available on any of these boats.



Photo] [*L.N.W.R.*

LONDON AND NORTH WESTERN RAILWAY STEAMERS ON THE LIFFEY AT NORTH WALL, DUBLIN.

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100-Mile Runs in 1913.

IN accordance with our annual practice, we present a review of the 100-mile non-stop runs found in the Summer time tables of the current year. The summary totals differentiate start-to-stop and slip coach journeys, and in the case of the Great Western table, which includes so many of the latter, the figures in the column giving total of runs are divided thus (4+3), the first numeral relating to the start-to-stop runs, and the second to the slip coach bookings. The footnotes give further information as to special features of particular runs. Except in cases noted, conditional stops which are frequently or regularly made are considered as controlling the length of non-stop runs. Runs made during Sunday, even where they are direct equivalents to week-day journeys, are included. In such instances a footnote appears.

Caledonian Railway (Eight Runs).

Between	Miles.	No. of Runs.	Journey by Fastest Train.	Speed Miles per Hour of Fastest Train.	Fastest Train.
			H. M.		
Carlisle and Perth	**150¾**	**2**	**3 3**	**49·5**	**2.5 a.m. D.**
Carlisle and Stirling	117¾	2	2 23	49·4	1.15 a.m. D.
Carlisle and Glasgow (Central)	102¼	2	2 8	47·9	5.55 a.m. D.
Carlisle and Edinburgh (Princes Street)	100¾	2	2 0	50·3	10.5 a.m. U.

NOTE.—The down trains from Carlisle to Perth, Glasgow and Edinburgh usually stop at Beattock for taking water and for assistance. If assisted from Carlisle, a stop is made at the summit for detaching the pilot. Therefore the non-stop runs to Perth are generally only 111 or 101¼ miles, while those to Glasgow, Edinburgh and Stirling are under 100 miles in length. Certain trains also have conditional stops which, if not allowed for, add several other items to the list, though not included above.

Great Central Railway (Four Runs and One Slip Journey).

Between	Miles.	No. of Runs.	Journey by Fastest Train.	Speed Miles per Hour of Fastest Train.	Fastest Train.
			H. M.		
Marylebone to Sheffield *viâ* Aylesbury	164¾	1	2 57	55·85	3.15 p.m. D.
Marylebone and Leicester *viâ* High Wycombe	107½	2†	1 54	56·58	6.20 p.m. D.
Marylebone and Leicester *viâ* Aylesbury	**103**	**1***	**1 49**	**56·7**	**3.15 p.m. D.**
Leicester and Marylebone *viâ* Aylesbury	103	1	2 15	45·77	1.32 a.m. U.

* By Slip Carriage. † Including 12.35 p.m. up on Thursdays and Saturdays.

Great Eastern Railway (Seven Runs).

Between	Miles.	No. of Runs.	Journey by Fastest Train.	Speed Miles per Hour of Fastest Train.	Fastest Train.
			H. M.		
Liverpool Street and North Walsham ..	131	2	2 38	49·7	1.0 p.m. D.
Liverpool Street and Yarmouth (South Town)	121¾	3	2 30	48·7	{ 10.20 a.m. D. and 1.40 p.m. U.
Liverpool Street and Trowse	**114**	**1**	**2 17**	**49·9**	**9.50 a.m. D.**
Liverpool Street and Beccles	109¼	1	2 22	45·8	1.53 p.m. D. (Sats. only).

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Great Northern Railway (Twenty-Nine Runs).

Between	Miles.	No. of Runs.	Journey by Fastest Train.	Speed Miles per Hour of Fastest Train.	Fastest Train.
			H. M.		
Wakefield (Westgate) and King's Cross	175¾	1	3 5	57·0	2.20 p.m. U.
King's Cross and Doncaster	156	3	3 0	52·0	9.50 a.m. D.
Retford and King's Cross	138½	1†	2 31	55·0	8.59 a.m. U (Not on Mon.)
York and Peterboro'	111¾	2	2 13	50·4	3.45 a.m. U.
King's Cross and Grantham	**105½**	**22‡§**	**1 50**	**57·5**	**5.58 p.m. U.**
Finsbury Park and Grantham	103	1	2 3	50·2	11.32 a.m. D.*

* Fridays and Saturdays only. † Not on Mondays. ‡ Including 8.59 a.m. up from Retford, which calls at Grantham on Mondays.
§ Including runs during Sunday, some of which are actually equivalents to weekday services.

Great Western Railway (Thirty-Seven Runs and Six Slip Journeys).

Between	Miles.	No. of Runs.	Journey by Fastest Train.	Speed Miles per Hour of Fastest Train.	Fastest Train.
			H. M.		
Paddington and Plymouth North Road *viâ* Westbury	225¾	1	4 7	54·8	10.30 a.m. D.
Paddington and Newton Abbot ..	193½	2	3 25	54·0	9.30 a.m. D.
Paddington and Exeter *viâ* Westbury ..	173⅜	5+1	3 0	57·8	*10.30 and 11.50 a.m., 3.30 p.m. D, 1.45 p.m. U.
Paddington and Taunton *viâ* Westbury	142⅞	4+3	2 30	57·1	*10.30, *11.50 a.m., *3.30 p.m. D., 11.0 a.m. U., 6.10 p.m. U., †2.45 p.m. D.
Paddington and Newport *viâ* Badminton	133¾	*a*5	2 30	53·35	11.30 a.m. D.
Paddington and Worcester	120½	3	2 10	55·6	4.45 p.m. D.
Paddington and Bristol *viâ* Bath ..	118¼	1	2 0	59·1	11.0 a.m. D.
Bristol and Paddington *viâ* Badminton	117⅝	5	2 0	58·8	1.5 p.m. D., 12.0 noon and 5.5 p.m. U., †4.30 p.m. D., †1.40 p.m. U.
Paddington and Birmingham	110½	4	2 0	55·25	11.5 a.m. and 2.35, 4.0 and 6.5 p.m. D.
Paddington and Bath	**106¾**	**4+1**	**1 48**	**59·4**	***11.0 a.m. D.**
Paddington and Frome	101¼	1	1 47	56·7	10.35 a.m. D.
Paddington and Knowle	100¼	0+1	1 48	56·0	*4.0 p.m. D.
Paddington and Badminton	100	*b* 3	1 42	58·8	†6.10 p.m. U.
Reading and Taunton	106¾	1	1 56	54·7	2.10 p.m. D.

* By slip coach. † Sunday trains.
a 3.35 p.m. D, and 1.48 p.m. U, have conditional stops at Badminton. *b* 3.35 p.m. D, and 2.38 p.m. U, are conditional stops.

London and South Western Railway (Four Runs).

Between	Miles.	No. of Runs.	Journey by Fastest Train.	Speed Miles per Hour of Fastest Train.	Fastest Train.
			H. M.		
Waterloo and Bournemouth Central .. .	**108**	**3**	**2 0**	**54·0**	**4.10 p.m. D., 9.8 a.m., 2.0 p.m. U.**
Waterloo and Christchurch	104¼	1	1 58	53·0	2.0 p.m. D.

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London and North Western Railway (Sixty-Three Runs and One Slip Journey).

Between	Miles.	No. of Runs.	Journey by Fastest Train.	Speed Miles per Hour of Fastest Train.	Fastest Train.
			H. M.		
Euston and Rhyl	209¼	1	3 58	52·7	11.10 a.m. D.
Rhyl and Willesden	203¾	1	3 54	52·2	3.38 p.m. U.
Euston and Liverpool (Edge Hill) ..	192¼	1	3 28	55·45	5.55 p.m. D.
Euston and Warrington	182¼	2§	3 28	52·5	11.45 p.m. D.
Euston and Wilmslow	176¾	2	3 11	55·0	6.5 p.m. D.
Willesden and Warrington	176¾	1	3 22	52·0	11.37 a.m. D.
Euston and Crewe	158	8§	2 51	55·5	*10.30 a.m. D.
Crewe and Willesden	152½	6§	2 47	54·7	6.16 p.m. U., 9.56 a.m. U. Sundays.
Crewe and Carlisle	141	10§	2 40	52·8	10.55 p.m. D.
Stoke and Willesden	140¼	1	2 29	56·9	1.19 p.m. U.
Euston and Stafford	133½	3	2 22	56·0	5.30 p.m. D.
Stafford and Willesden	128	1	2 17	56·0	11.40 a.m. U.
Euston and Rugeley	124¼	†1	2 15	55·2	2.40 p.m. D.
Warrington and Carlisle	116¾	2§	2 17	51·2	3.19 a.m. D.
Euston and Birmingham	113	11	2 0	56·5	All non-stop trains.
Crewe and Bletchley	111¼	2§	2 16	49·0	4.22 a.m. U.
Willesden and Birmingham	**107½**	**3**	**1 53**	**57·0**	**8.52 a.m. D., 5.32 p.m. D. Sun. and 11.30 a.m. U. Sun.**
Crewe and Holyhead	105¾	4§	2 4	51·4	2.0 a.m. U.
Wigan and Carlisle	105	4§	2 2	51·6	12.12 a.m. D.

* The 10.30 a.m. D from Euston calls at Crewe at 1.21 p.m. for division. If divided throughout, the respective sections run through to Edge Hill or Wilmslow without stop. † By slip carriage.
§ Including journeys during Sunday, some of which are actually equivalents to weekday services.

Midland Railway (Twenty Runs).

Between	Miles.	No. of Runs.	Journey by Fastest Train.	Speed Miles per Hour of Fastest Train.	Fastest Train.
			H. M.		
St. Pancras and Shipley	206	1	4 3	50·86	11.50 a.m. D.
Leeds and St. Pancras	196	1	3 40	53·45	3.40 p.m. U.
Rotherham (Masboro') and London ..	161¾	1	3 2	53·32	1.43 p.m. U.
St. Pancras and Derby	128¼	1	2 18	55·7	7.10 p.m. D.
London and Nottingham	123¼	*8	2 12	56·13	6.3 a.m. U.
Trent and St. Pancras	**119¾**	**†3**	**2 7**	**56·57**	**11.50 a.m. U.**
Leeds and Carlisle	113	‡4	2 17	49·49	12.38 a.m. D.
Shipley and Carlisle	102	1	1 58	51·01	11.50 a.m. *ex*-London. D.

* Including 11.33 a.m. D Saturday Excursion for Scotland, the 9.30 p.m. D, which has a conditional stop at Kettering, and Sunday trains.
† Including the regular conditional stop of the 6 p.m. D from St. Pancras, and the 8.15 p.m. U, which has a conditional stop at Luton.
‡ The 4.8 a.m. *ex*-Leeds always makes the conditional stop at Keighley, and is not included.

North Eastern Railway (Thirteen Runs).

Between	Miles.	No. of Runs.	Journey by Fastest Train.	Speed Miles per Hour of Fastest Train.	Fastest Train.
			H. M.		
*Newcastle and Edinburgh	124½	†13	2 18	54·1	11.14 a.m. D.

* East Coast Trains drawn by North Eastern Railway engines but between Berwick and Edinburgh on North British Railway.
† Including one up and one down horse box, carriage truck, and motor-car train, which "runs only when required," also trains during Sunday.

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The Government and the Channel Tunnel.

A DEFINITE change in public opinion regarding this great scheme was manifested in the deputation of members of the House of Commons who had an interview with the Prime Minister in July last. The deputation was neither. large nor imposing, but it represented all sections of the Chamber, and Mr. Arthur Fell, the Conservative member for Great Yarmouth, who took the initiative on the occasion, had been at pains to ensure that the different parties — Liberal, Conservative, Irish Nationalist and Labour—should, as far as possible, be evenly balanced. Nearly ninety members had signed a memorial calling the attention of the Government " to the important changes which have taken place in recent years materially affecting the question of the construction of a tunnel under the Channel, to link up the railways of the United Kingdom with those of France and the Continent of Europe." The memorialists urged the Government to " reconsider the adverse decision come to, for strategic reasons, in 1883 and 1907, and to give due weight to the new conditions that have arisen." Mr. Asquith was not unnaturally somewhat surprised that out of a total of 670 members a larger number of signatures had not been obtained, but the right hon. gentleman correctly assumed, we understand, that it would have been quite easy to show that the prayer of the memorial was endorsed by a very considerable section of the House of Commons, while, no effort had yet been made to ascertain the opinions of members of the Upper Chamber.

Limited, however, as were the memorialists in strength, they included not a few who have in the past been strongly opposed to any connection being made between England and France by means of a tunnel. These gentlemen frankly confess that the change in their views on the subject has been brought about wholly and solely by the altered conditions affecting national defence, the introduction of aircraft having, for all practical purposes, destroyed the insularity which in the past was always counted as a vital source of England's strength. It would not have been difficult to show that this new attitude in regard to the Channel Tunnel is adopted by representative men of all classes, as also in the mind of the public generally. And considering the greatly added force which the arguments in support of the scheme thus assume, we frankly confess that, like the Prime Minister, we were somewhat disappointed with the apparent paucity of the case presented by the deputation. Mr. Asquith—who, be it remembered, has always personally been in favour of the project—expected to hear the whole situation reviewed. But all the salient facts of the past were before him, and on behalf of the Government he promised that the subject should be carefully considered with an unbiassed mind. At the moment, however, no decision can be announced, inasmuch as the Committee of Imperial Defence have not yet advised the Cabinet, and this they cannot do until they receive the reports of the Admiralty, the War Office and the Board of Trade embodying the results of the investigations upon which—as already stated in the RAILWAY MAGAZINE—they are at this moment engaged.

In these circumstances, it was not possible for the deputation to carry the subject much further. But, at the same time, it served a useful and a very important purpose in showing that the Channel Tunnel is more earnestly desired than ever, that the wish is to have it constructed as soon as possible —whether by the Governments of Great Britain and France or by private enterprise matters little—that the work from an engineering point of view presents no difficulty, and that, once the proposal has been sanctioned, the whole of the money required for the purpose will immediately be forthcoming. All who favour the scheme will note the fact that the present revival of the question is not due to any action on the part of the Channel Tunnel Company, the South Eastern and Chatham Railway, or the Northern of France Railway Company, although all three bodies are still eager to co-operate in the work, and to adopt any precautions that may reasonably be demanded in the interests of national safety. His Majesty's Government have themselves re-opened the question, and while Mr. Asquith's reply to the deputation was non-committal, it was certainly much more favourable than any official pronouncement made upon the subject in recent years.

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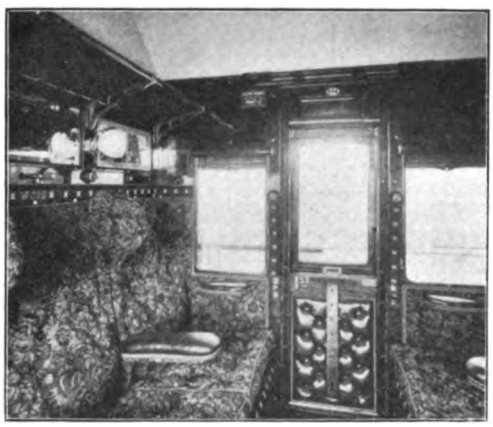
New Rolling Stock for Anglo-Scottish West Coast Trains.

SPECIAL vehicles have for some years been used for the 2 p.m. express from Euston to Glasgow, Edinburgh and Aberdeen, and for the corresponding services to London; but hitherto ordinary West Coast Joint vehicles have been employed for other Anglo-Scottish services. These are splendid coaches, second only to the 2 p.m. stock, but new vehicles have now been constructed at Wolverton, to the design of Mr. H. D. Earl, carriage superintendent, London and North Western Railway, for use on the 9.55, 10 and 10.5 a.m. trains from Euston and the 10 a.m. from Glasgow, 10.5 a.m. from Edinburgh and 6.45 a.m. from Aberdeen. Most of the new vehicles are of ordinary types, but they are made up with new restaurant cars of existing designs, the result being the production of trains which more than maintain the high standards already realised by the West Coast Joint Stock.

We reproduce photographs of a train composed of the new stock, headed by No. 2222 *Sir Gilbert Claughton*, together with interior views of first and third-class ordinary compartments. The following particulars describe the new stock:—

DIMENSIONS:	
Total length over buffers	61 ft. 0 in.
Length overall of body	57 ,, 0 ,,
Width at waist	9 ft. 0 in.
Width under cornice	8 ,, 9 ,,
Height of body at centre	8 ,, 5 ,,
Height to top of side cornice.. ..	6 ,, 7¾ ,,
Total height from rail level to top of roof	12 ,, 5¼ ,,
Total height from rail level to top of side cornice	10 ,, 8¼ ,,

The structural framing of the vehicles is teak and oak, the outside being panelled with mahogany. Internal finishing of the first-class compartments is of polished walnut with flush panels of Italian walnut. On either side of the compartments are square frames of walnut with three openings, a bevelled edge glass mirror being in the centre, with black and white photo prints in grey cut mounts on each side. A spacious luggage rack is provided, of blue corded netting, the brackets being of brass, finished in oxydised copper and relieved. Above the rack is a reeded panel of mahogany in walnut framing. Narrow flat mouldings of walnut surround the edges of light openings. The compartments are provided with two hat-pegs placed in opposite corners over quarter lights. Spring clips for holding reserve seat labels are placed over each corner seat, and ash-trays are provided in all smoking compartments. Brackets are fitted to support portable tables when required. Balance blinds are fitted to the quarter lights and cable blinds on all passenger doors covered with blind hoods of walnut. Electric bell pushes are fixed in all compartments. The seats and backs are covered with Saladin moquette. The spring seats are made of spiral springs, self-contained, with a loose cushion on top and the whole is fitted with folding arm and head rests. Partitions and sides down to top of cornice moulding are painted white. The floors are covered



INTERIOR OF FIRST-CLASS COMPARTMENT: NEW WEST COAST JOINT STOCK.

INTERIOR OF THIRD-CLASS COMPARTMENT: NEW WEST COAST JOINT STOCK.

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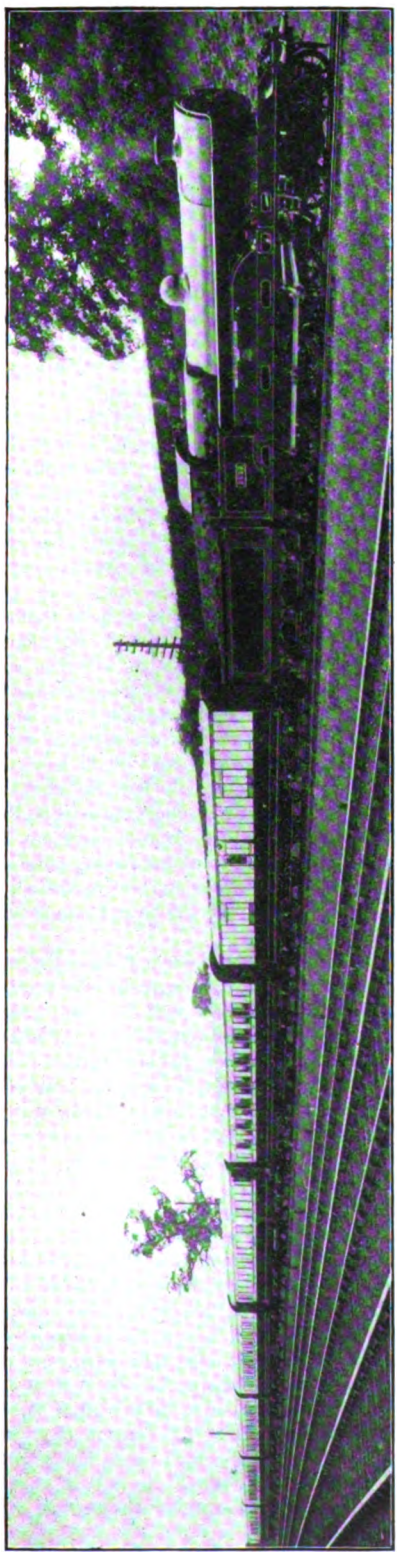

[L.N.W.R. Photo]

TRAIN OF NEW WEST COAST JOINT STOCK VEHICLES FOR THE MORNING ANGLO-SCOTTISH EXPRESSES BETWEEN EUSTON AND GLASGOW, EDINBURGH AND ABERDEEN.

with " Kork " lino and rugs are placed in between the seats, these being of such a colour as to harmonise with the seats and general finishing. The roofs in all compartments, lavatories, etc., are covered with three-ply birch and painted white.

Internal finishing of the third-class compartments is of polished teak, with cornice mouldings of teak. On either side of compartment are squab frames of teak with three openings, a bevel'ed edge mirror being in the centre and " black and white " photo prints in grey cut mounts on each side. Each compartment is fitted with a large luggage rack, the front rod being supported by neat metal brackets, finished copper oxydised and relieved, and the network of the rack is of white cord. From ceiling down to top of cornice moulding is covered with three-ply birch and painted white. The compartments are provided with spring clips (for holding reserved seat lables) placed over each corner seat, electric bell pushes, and brackets to support folding tables when required. Balance blinds are fitted to all lights, and cable blinds with teak hoods are fitted on passenger doors. The seats are covered with crimsom rep and are made in the usual way and covered with a loose cushion. Another feature is that they are all pivoted at the back and made to turn up so that the floors under seats can be readily cleaned. All third-class floors are covered with Parquetry pattern lino.

First-class corridors are all finished in polished fumed oak lagging, vee jointed and fixed vertically, cornice moulding of walnut, skirtin·s and mouldings surrounding lights of walnut, safety bars across large lights of brass-finished oxydised copper. The third-class corridors are all finished in polished fumed oak lagging, vee-jointed and fixed vertically, cornice mouldings of teak, safety bars across large lights of brass-finished oxydised copper. A partition door with centre panel of glass is placed in the corridor between the first and third-class. The first-class lavatories are finished in polished fumed oak lagging, vee-jointed and fixed vertically. Cornice mouldings, skirtings and frames surrounding lights being of walnut. The light is of obscured glass with a safety rod across of teak. Standard earthenware wash-basins fixed on metal brackets are fitted, with hot and cold water supply, liquid soap bowls, water-waste-preventer flush tank, soiled towel bins and small racks of expanded metal. The floors are covered with fireproof flooring of Terrazzo mosaic. Third-class lavatories are finished in polished mahogany lagging, vee-jointed and fixed vertically, cornice mouldings of teak and skirting of mahogany. The light is of obscure glass with a wooden safety rod of teak. Lavatories are fitted up with standard earthenware wash-basins fixed on metal bracke·s, with cold water supply, liquid soap bowls, water-sealed w.c., pans with combination water-waste-preventer flush tanks. Floors are all covered with fireproof flooring. The guard's compartment is fitted up with hand-brake gearing fixed vertically, and all brake fittings, etc., for dual brakes; also electrical bell, tool box, fire extinctor and wire dispatch rack.

The vehicles are mounted on underframes made of rolled steel sections and carried on four-wheeled bogies and are fitted with the vacuum and Westinghouse brakes, Stone's system of electric light, the Wolverton system of direct steam heating, passenger communication throughout, and are well ventilated with torpedo vents in compartment roofs, hinged flaps and drop-lights in outside doors and extractor vents in lavatories.

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Chinese Railways.

PERMANENT bridges on the Changsha-Chuchou line in the province of Hu-Nan have taken the place of the original temporary trestle bridges and traffic is now being carried on without interruption, two trains running each way. So far, little goods traffic has been attracted, carriage on the adjacent waterway—the Siang River—being so much cheaper. A certain quantity of coal has, however, been carried from P'inghsiang to Changsha. A European firm obtained a 200,000 tael order (about 30,000*l.*) for additional rolling-stock, and a British firm a large order for tools and steel. A further section from Chuchou to Luk'ou, about 30 li (10 miles) in length, was commenced at the end of September last, and towards the middle of December about nine-tenths of the earthworks and one-half of the bridge and culvert work was reported completed. Two European firms obtained the order for the rails. This section will probably be opened to traffic a few months hence. Down to the end of September, 1912, the capital expenditure on the line, only 33 miles in length, amounted to close on 6,500,000 taels (about 960,000*l.*). When the cost of the Chuchou-Luk'ou section is added, the total expenditure cannot fall far short of 7,000,000 taels (about 1,000,000*l.*) for a railway 43 miles in length, of which only 33 miles are completed. "When, in addition, it is remembered," says the British Consul, "that the line is very badly laid, that much of the rolling-stock is inferior, and that the receipts are exceedingly small, it will hardly seem surprising that the shareholders should have acquiesced in the policy of nationalisation. On the other hand, they want the whole of the money squandered on the short section of ill-constructed line refunded before they will stop work or hand over the line to the Central Government. In the meantime the rough survey of the line by British engineers, which was interrupted in 1911 by the outbreak of the revolution, has been completed, and a more detailed survey from the Hupei border to Yochow and thence direct to Changsha, avoiding Siangyin, which it was originally intended to touch, is being carried out."

The Chuchou-P'inghsiang line is being reorganised with a view to the regular carriage of passengers and general merchandise, as well as coal. Its permanent way is being repaired and strengthened, the old rolling-stock patched up, and an order for an additional locomotive and three passenger coaches has been placed in Germany. An additional levy in aid of railway construction, based on the amount of land tax paid, was resumed last summer and has hitherto been devoted to work on the Chuchou-Luk'ou section. When the Hankow-Canton trunk line has been nationalised this levy, supplemented by the purchase price paid by the Central Government for the section already built, and possibly also by a foreign loan, is to be devoted to the construction of branch lines. A number of proposals for such branch lines have already been put forward, but in no single case it is stated, "do the financial and other practical aspects of the question appear to have been given a moment's consideration." A start will be made with a railway line from Changsha to Changteh and on to Ch'en Chou Fu. Even this line, it is added, has little chance of being completed at all, much less at a cost which will enable it to cover its working expenses, unless the shareholders will consent to both the construction and the expenditure being placed under foreign supervision.

From the province of Chinkiang, we learn that the traffic to and from Chinkiang station by the Shanghai-Nanking railway continues to increase, and does not yet seem by any means to have reached its limit of expansion. The arrangement by which goods covered by transit pass are allowed to be carried by rail—an arrangement which has been desired for some years and only brought about in 1912—has affected the railway returns most favourably. Nothing has yet been done to carry out the Kiangpei railway scheme, and the feeling seems to prevail that as far as Chinkiang is concerned, it would be better to improve the Grand Canal than add to the existing lines.

Traffic receipts of the Tientsin-Pukow Railway for the first year after its opening reached a total of 1,433,862 dol. (coaching, 565,922 dol., and goods, 867,940 dol.) Of this sum 691,292 dol., or nearly one-half, was received during the last quarter of the year. In that period 3,585 wagons, carrying 88,120 tons of goods, were booked to Pukow station alone. The service consists of two express trains, which run weekly, covering the distance of 641 miles in 26 hours.

The following railways are projected in the province of An-hui:—(1) Hsin-yang-chou, on the Peking-Hankow line to Pukow, the terminus of the Tientsin-Pukow line. The concession, dated from 1898, is in the hands of the British and Chinese corporation. (2) Wuhu to Kuangtê and Hangchow. (3) Wuhu to Nanking. (4) Hsin-yang, on the Hankow line, to near Peng-pu on the Pukow line *via* Shou-chou and the valley of the Huai River. (5) Anking to Shou-chou. At present the first-mentioned is the only one which seems likely to be seriously undertaken. British capital is at the back of this project; the others are Chinese ventures pure and simple.

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PERTINENT PARAGRAPHS

Locomotive Performance on the Great Southern and Western Railway.

As providing the longest through train journeys and the longest runs in Ireland without booked stop, the Great Southern and Western Railway calls for notable locomotive work. The 11 a.m. "tourist" express supplies the fastest ordinary service from Dublin to Cork, and is usually a heavy train, though most of it goes through to Killarney and only a few vehicles to Cork. A run made early in the season, when the load consisted of only three bogies and one six-wheeler for Killarney, two bogies and one six-wheeler for Cork and one bogie and two six-wheelers for the slip at Limerick Junction, may be mentioned. The engine was No. 327, of the large taper-boiler 4–4–0 class. A good start was made from Kingsbridge, though gradients are at first difficult, and at Lucan, seven miles out, the 50 rate had been reached and was maintained for many miles. Sallins (18 miles) was passed in 28 min., at 55 miles per hour. The 60 rate was soon afterwards reached, and beyond Kildare (30¾ miles in 43 min.) 70 was touched. Continuing at good speed, Maryborough (51 miles) was passed in 65½ min., and after a long pull over adverse grades the first stop (not time-tabled) was made at Ballybrophy, 66¾ miles in 87 min. Here water was taken and tickets checked, and after some delay we started on the through run to Mallow. Thurles was passed at 65 miles per hour in 24½ min. (20 miles), and at Limerick Junction we ran by the peculiar station, with its long both-direction platform and bays at each end, at about 45 miles per hour, the slip vehicles being detached on the through line, to be brought independently to the platform. The 40½ miles from Ballybrophy had been covered in 47½ min. The remaining 37¼ miles to Mallow, largely on favourable grades, took 40¾ min. The continuation to Cork, with three vehicles only, does not call for attention. Returning with the Limited Mail dining-car vestibuled train, No. 323, of the same class as No. 327, had seven bogies and one six-wheeler throughout. The start is very hard, and an old engine acted as pilot to Blarney, the 6 miles taking 14 min. start to stop. Thence to Mallow single-handed is still difficult, 23½ min. being taken for the 15 miles. Outside Emly station signals caused a stop in 41½ min. from the Mallow start (30¾ miles). At Limerick Junction the train ran by the rear portion of the platform and then backed to the platform line, proceeding out by the same route to continue the journey. From Limerick Junction to Ballybrophy (stop not scheduled) the 40½ miles were covered in 48½ min. Thence to Maryborough the 15¾ miles took 20¼ min., and the final run of 51 miles to Kingsbridge was made in 58½ min. As Limerick Junction had been left 12¾ min. late, owing to heavy station work there and at Mallow, and only about a minute had been gained at Maryborough, while 3 min. had been spent at Ballybrophy, it was decidedly good work to reach Kingsbridge only 2½ min. late.

* * *

An Ox-Power Railway.

In various parts of the world there are many peculiar railways, and it is doubtful whether any line is really unique in any characteristic. But an American contemporary tells of a steer-operated railway—State-owned, too—which with its bovine motive power must nearly merit this designation. The line, owned by the State of Texas, connects the town of Brazoria with a prison plantation at Clemens Farm, six miles away. There are two locomotives, but by a combination of circumstances both were for a considerable period "laid-up" at the same time. For the cane harvest two engines were hired, but to save expense these were then returned. The line has, however, considerable traffic, the prison farms accounting for a fair volume of freight throughout the year. Accordingly it was determined to use oxen instead of locomotives, and to employ corn and blackstrap molasses as fuel instead of coal. The beasts draw strings of cars between Brazoria and Clemens, and in consequence many facetious suggestions have been made. The writer from whom we quote develops some of these. Here is a proposed advertisement:—

* * * * * * * * * * * * * * * * *

TEXAS STATE RAILROAD

"The Longhorn Route."

SLOW BUT SURE.

No Smoke! No Dust!

No Cinders!

* * * * * * * * * * * * * * * * *

There are other advantages, as the following remarks indicate:—The road has a casualty record far below the normal. Indeed, it can truthfully be asserted that it has "never killed a passenger." The locomotive never exceeds the speed law, nor does it prematurely disturb the slumbers of citizens, as steam locomotives are wont to do, whistling merrily as they go cheerfully to work in the early morning. It is not necessary on this railroad to provide water tanks between the terminals, for the oxen can go six miles without water. Obviously, a full crew

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is not necessary. A driver is, of course, essential, but it is unnecessary to employ a fireman. If "guards" are needed, they have plenty of them on Clemens Farm. Neither is it necessary to employ train dispatchers, telegraph operators, towermen or crossing watchmen, although it has been suggested that the State ought to mark the highway crossings with signboards, reading:

* * * * * * * * * * * * * * * * * *
* *
* RAILROAD CROSSING ! *
* LOOK OUT *
* FOR THE STEERS! *
* *
* * * * * * * * * * * * * * * * * *

This arrangement was, however, only a temporary one, and presumably by this time at least one of the steam locomotives is again at work. Ox-power was used on another three-mile railway between a state farm and Harlem station, on the Southern Pacific Railway, but a locomotive is now employed.

* * *

The Croagh Patrick Pilgrimage.

THERE are few events nowadays in which railwaymen are not concerned directly or indirectly, but railway arrangements seldom play so important a part in a religious ceremony as they do in connection with what is known as the annual Croagh Patrick Pilgrimage. Croagh Patrick is the highest mountain in County Mayo, on the west coast of Ireland, and is magnificently placed at the head of Clew Bay, overlooking at one side the 365—one for each day in the year—islands guarding the entrance to Westport harbour, and, on the other, the lakes and fells of Connemara. The history of the mountain is associated closely with traditions surrounding the name of St. Patrick, and is the scene each year of stately religious ceremonies, held on the summit of the hill, and attended by pilgrims from all parts of Ireland. The railway arrangements, in the hands of the Midland Great Western Company, are of an elaborate character, and as the scene of the ceremonies is about seven miles from Westport, the nearest town and railway station, and the services take place in the forenoon of the day selected, all the special passenger trains run are timed to arrive between 6 and 9 a.m. Specials originate at Castlebar, Killala, Claremorris (2), Ballinlough, Ballinrobe, Athlone, Sligo and Limerick (Great Southern and Western), while connections are given in addition from Galway, Ballinasloe, Loughrea, Achill, and Newport. Besides the passengers travelling by the special trains on the day of the event, hundreds of pious pilgrims proceed westwards from Dublin and other places on the previous evening, many of whom are compelled, owing to the limited accommodation available, to pass the night in the streets of Westport, or even on Croagh Patrick itself. A poster issued in connection with the pilgrimage—which was last made on Sunday, July 27—shows the conical mountain with the chapel at the summit, 2,510 ft. above sea level. To quote the placard, there were "Special trains from everywhere," and the rates were very reasonable indeed, ranging from 6d. return from Castlebar and 1s. from Achill and Claremorris, to 5s. (available three days) or 7s. 6d. (available for a week) from Dublin, with corresponding fares where longer journeys and railways other than the Midland Great Western were concerned. On Saturday, July 26, pilgrimage tickets were issued at Dublin by the 10.30 a.m. and 8.30 p.m. trains and by a fast special train at 2.45 p.m. The "Night Mail" from Dublin conveyed through carriages for Westport. On the Sunday 12 special trains were booked to arrive at Westport by about 9 a.m. At 6 p.m. a special train left Westport for Dublin, the other specials following at intervals of 12 minutes. As regards the ecclesiastical arrangements, 30 masses were celebrated in the chapel on the mountain top between 9 a.m. and noon, and sermons were preached by well-known Irish divines, one in English the other in Erse. The Archbishop of the West was advertised to accompany the pilgrims to the holy mountain. The poster concluded with the following injunction: "Children of St. Patrick muster in your thousands on this holy mountain and pray to Him on the hallowed height from which He blessed our country and our race." Altogether the Midland Great Western Company handled about 6,000 passengers in connection with the pilgrimage, dealing with them with the usual accommodation found at a small country station—a task, as railwaymen will appreciate, of no little difficulty, and requiring, if smooth working is to be achieved, much forethought and careful preparation.

* * *

A Railway by the Sea.

ALTHOUGH many railways run for some distance near or within sight of the coast, few follow the shore as closely as the Dublin and South Eastern Railway from Dublin to Wicklow. Indeed, in this case the company has to pay the penalty of following the sea so closely, its annual "coast erosion" expense account being a serious item. To avoid this loss a new line further inland is being constructed along part of the route. From a tourist point of view, the shore route provides one of the most wonderful scenic journeys to be found anywhere. Almost as soon as Westland Row station is left the Dublin and Kingstown Railway—the actual owners as far as Kingstown though worked by the Dublin and South Eastern Company—comes close to the sea. In the neighbourhood of Booterstown, Blackrock, Seapoint and Salthill the line is in many places separated from the shore by only a parade and footpath, so that the traveller can see right across Dublin Bay, though in some cases a protecting wall hinders the view. Kingstown old station includes a covered platform and engine line, and is used for local trains from and to Dublin. Outside the roof, though approached through the same booking hall, is a single platform used by other trains in both directions, with a side line so that up trains can pass if not booked to call. Immediately beyond the platform the railway becomes single track for a few yards to enable the single-track branch to Kingstown Pier to diverge, but the main line immediately doubles again and is so for several miles further. Before reaching Kingstown from Dublin one obtains a fine view of the harbour and piers, as well as of the yachting craft which muster there

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in large number during the season. For some distance further, however, the railway is in cutting, but just after leaving Dalkey it emerges on to the shore and continues so, almost without a break, all the way to Bray. As it follows the curve of Killiney Bay, one obtains wonderful views of the coast from Kingstown to Bray Head, with the Hill of Howth, "Ireland's Eye," and Lambay Island in the distance. For most of the distance the railway is on embankment immediately overlooking sands and shore. About a mile and a half before reaching Bray the Dublin and South Eastern line from Harcourt Street comes in alongside, this double road and the single line from Dalkey rendering this section three track, though no connection is made until outside Bray. Otherwise the Harcourt Street line is entirely inland, though it passes through beautiful country and gives fine views of the Wicklow mountains. Bray consists mainly of one long platform used for both directions, with cross-overs from the side lines enabling one train to pass another standing at one end of the platform and draw alongside the other portion. Onwards the single line passes Bray Head by a series of rocky cuttings and three short tunnels emerging at a considerable height above the sea. To Greystones the line gives splendid views of this rocky shore, and then runs for about 12 miles alongside a beautiful stretch of coast until Wicklow is reached. Thenceforward the scenery is of an inland character, but thoroughly justifies the title of "The Garden of Ireland."

Photo] [*W. Lawrence.*

DALKEY (CORNER OF KILLINEY BAY): DUBLIN AND SOUTH EASTERN RAILWAY.

* * *

Railway Superstitions.

SOME time ago we gave particulars of a number of superstitions once current among railwaymen. A trans-Atlantic railway service contemporary—the *Railway Employees' Magazine*—deals with the subject from the American point of view, and gives examples where superstition has been utilised to hoax ill-informed workmen. It is asserted that while a large percentage of railway employés still indulge in the luxury of a pet superstition, the old-time railroader was as "superstitious as a South Sea Islander and as full of whims as an old housewife." Men, it is stated, did not care to run over the road unless a horse-shoe was fastened to some part of the wood-work of the locomotive or caboose. There is a well authenticated case of a brakeman who became demented because he failed to find a freight car bearing a certain lucky number. One driver used to tell how, when working a night train, at a lonely spot the wraith of an old track-walker killed there "appeared on the track as natural as life, with his maul over his shoulder, and after keeping ahead of the train, which was making a good sixty miles an hour, had disappeared in the bushes." Another driver who was not superstitious afterward thought he saw a similar appearance at nearly the same point, but upon investigation found that the dancing shadow on the track was made by a wet maple leaf that had become flattened against the head light glass! Working on his engine alone one dark night, a driver was startled to hear the locomotive bell begin to toll in a very deliberate and nerve-racking manner; but being of a sceptical turn of mind, he discovered a young cleaner at the other end of the line, the remaining end being fastened to the clapper of the bell. A fireman, inclined to be superstitious, was nearly frightened out of his wits in this way. One of the train men fastened a bell cord to the movable seat upon which the fireman was sitting. When the locomotive was passing a spot where an engineer had been killed the cord was pulled, causing the fireman to fall off the seat. For some time after he believed that the dead driver was in some way connected with the occurrence. An elderly Irish cleaner was sent to "fire up" an old engine that was said to be haunted, and a young fireman overheard the foreman giving the

Photo] [*W. Lawrence.*

KILLINEY BAY: DUBLIN AND SOUTH EASTERN RAILWAY.

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order. The fireman crawled into the firebox, and when the cleaner threw in a stick of wood, the fireman threw it out. The old man was startled, but when he saw the second stick come out, apparently without hands, he "took to the woods." Thus another "mystery" was added to the growing collection.

* * *

Peculiar Electric Locomotive Designs.

In this country, even in its most advanced forms the electric locomotive is a relatively simple machine, comprising usually two motor bogies carrying the main frame, and a suitable superstructure for the enginemen containing the switch, control and brake gear. But in Continental countries it is frequently much more elaborate, including in many cases coupled wheels and coupling rods driving from motor or dummy shafts; while in America it is often a very large machine, in some instances of double-unit type—that is, of two duplicate sections operated as one. For example, on the Pennsylvania Railroad some of the electric locomotives provide the equivalent of two 4–4–0 engines coupled back to back, the respective sets of four-coupled wheels being driven by inclined coupling rods from large motors mounted on the main frames. Coupling rod designs have, indeed, been in considerable favour for some years past, but there is a tendency to revert to axle-mounted or direct-geared motors. On the New York Central and Hudson River Railroad a new design of articulated electric locomotive is being introduced for heavy passenger traffic. It consists of two hinged frames, each on two four-wheeled bogies, and these carry by pivotal connections the superstructure. All axles are directly motor driven, so that eight motors are provided. It is claimed that these engines can pull a 1,000-ton train at 60 miles an hour, although they weigh only about 100 tons as compared with the 115 ton engines they are superseding. For goods traffic some peculiar locomotives are in use. They are in two duplicate portions, each comprising a four-wheeled carrying bogie, with two pairs of driving wheels each operated from its own motor-driven dummy shaft through horizontal coupling rods. There are therefore four short independent coupling rods on each side, giving the combination machine a peculiar appearance. It is difficult to express the wheel arrangement according to the usual notation, but it may be given as 4–2–2–2–2–4, with the explanation that each pair of driving wheels is coupled to its own motor shaft.

Cahirmee Horse Fair.

Away in the south-west of Ireland, seven miles from Mallow and 28 miles from Cork, on the Great Southern and Western main line, is the small roadside station of Buttevant. Seven trains daily suffice for the usual requirements, and the station is in no way distinctive, except that it has horse loading banks and a few sidings; but for a few days each year it is a centre for horse-box traffic from all over Ireland, hundreds of horses from all countries, and including the best breeds obtainable, being sent to the famous Cahirmee horse fair and then distributed to the orders of their new owners. In reference to this event, the *Cork Examiner* wrote:—"The 13th and 14th July are the days set out by Royal Charter for the fair, but as that would include a Sunday, the hands of the Cahirmee clock had to be put back, and indeed a similar course will have to be adopted for the next three years. Up to recent times the four days preceding those stipulated for the holding of the fair saw more business done on the streets of the adjoining town of Buttevant than was actually done on the field. Indeed, so brisk was the business in the streets that there was very little left for buying when it came to the actual fair. Thanks, however, to the untiring zeal of Mr. A. Carroll, brother to the courteous Baron of the fair, that has been stopped, and the proceedings are now conducted entirely in the fair field. So far-reaching has been the effect of the injunction which Mr. Carroll got that on Sunday there was not a horse to be seen in Buttevant. The history of the fair since its institution in the reign of Charles I. has been a rather remarkable one. It has become a national asset that must ever be reckoned with in the country's life. It possesses a great importance in a country so noted for its agricultural and horse-breeding, and there are few who are ignorant of the fact that the Irish horse is a much coveted animal the world over. As a producer of the best class of horses this country has a world-wide reputation, and every year begets fresh testimony to the justifiableness of that reputation. Hence the attraction that such a renowned fair as Cahirmee creates." At the fair all the leading Irish, English and Scotch buyers, as well as representatives of many Governments are present, and notable prices are often realised. To deal with the traffic special trains are run to Buttevant by the Great Southern and Western Railway. The company received this year close on 800 horses for despatch by train, occupying, including horse-boxes and cattle wagons, about 200 vehicles. These were worked off as required after the fair by special and ordinary trains in various directions, the greater portion travelling in the Dublin direction.

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On Thursday, July 31, the "Devon and Cornwall Special," described in our last issue, left Paddington station at 9.30 a.m. on its initial journey to the counties from which it takes its name. By courtesy of the Great Western Railway, we are able to illustrate the departure of the train and to show one of the arrangements adopted for carrying bicycles in the cycle van included in the make-up of the train. The engine selected to make the non-stop run to Newton and September. The coaches, of the latest design, well maintain the high standard of rolling stock accommodation and equipment utilised by the Great Western Company. There is every indication that this development will amply justify itself, and further developments on similar lines are probable in the near future.

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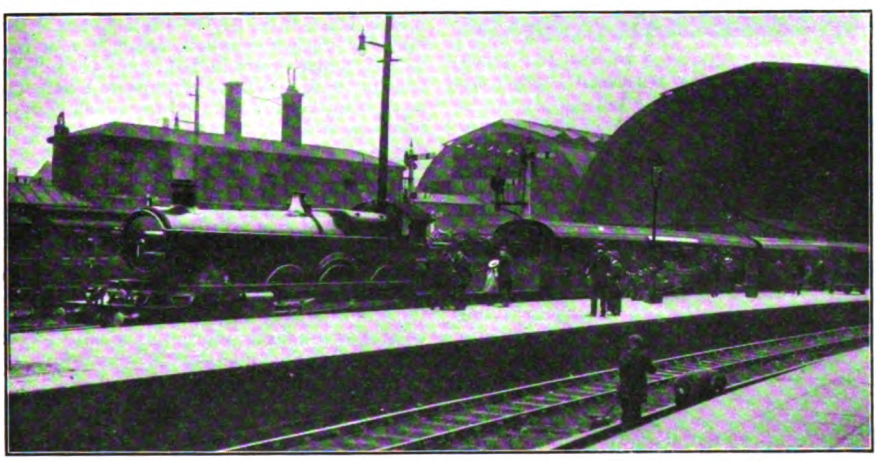
In the thriving Brazilian State of Sao Paulo, the railway mileage now reaches a total of 5,598



THE "DEVON AND CORNWALL SPECIAL" READY TO LEAVE PADDINGTON FOR THE WEST.

4–6–0 four-cylinder locomotive No. 4038, *Queen Berengaria.*

Abbot (184½ miles in 205 min.) was No. 4038 *Queen Berengaria*, one of the four-cylinder 4–6–0 engines of the "Queen" series. As a writer in our enterprising contemporary the *Daily Graphic* remarks, *Queen Berengaria* left for the great West Country with a whole trainload of faithful subjects, "all of the first-class variety," though the train is believed to be the first express run exclusively for third-class passengers other than at excursion fares. It was well loaded, and the records of booking—including on one day a party numbering 200—prove that the "All Third" will carry its full complement of passengers, seats for 336 being provided in the standard make-up—shown diagrammatically in our last issue—with restaurant car, cycle van, and ample luggage accommodation. The train will run every Saturday until September 20, while the return train, leaving Falmouth at 8.45 a.m. and reaching Paddington at 3.43 p.m., is booked for every Saturday throughout August kilometres. It is announced in the Brazil "Official Bulletin," forwarded to the Railway Magazine, that sanction has been given for the construction of the San Francisco Railway between the town of Uniao da Victoria and the Parana river. This section will be a little over 723 kilometres in length, and the estimated cost is about £5,600,000. Sections of the Tocantins Railway between Alcobaca and Cameta (201 kilometres) and between Praia da Rainha and St. Joao do Araguaya (106 kilometres) have also been approved, the estimate for the first being £780,000 and for the second £680,000. The principal railway companies are the Sao Paulo Railway Company (a British enterprise), Companhia Mogyana, Companhia Paulista, Companhia Sorocabana, and the Central Railway of Brazil, connecting the city of Sao Paulo with Rio de Janeiro. The financial position of all these is declared to be excellent, and dividends are heavy and regular. An extraordinary growth

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CYCLE PROTECTOR IN VAN: "DEVON AND CORNWALL SPECIAL," GREAT WESTERN RAILWAY.

has been witnessed in the capital of the State. In 1912 the population was estimated at 410,000 inhabitants as compared with 380,000 in the previous year. Building is proceeding very rapidly, but the demand for houses is very much in excess of the supply. During last year over 5,300 houses were constructed in the city. Rents have increased on an average over 25 per cent. in 12 months, and are 20 per cent. higher than in the federal capital, Rio de Janeiro. Land values have reached an altogether fantastic figure.

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THE Royal Agricultural Show at Bristol imposed very heavy traffic on the Great Western Railway. During the five days from July 1 to 5 179,000 people attended, exclusive of season ticket holders. His Majesty the King was present on Friday, July 4. Particulars of the work entailed are given in the company's magazine. Twenty-five special live-stock trains with passenger-rated traffic were run to Clifton Down station, and in order to meet the traffic conveyed by ordinary trains to Temple Meads, a special pilot service to Clifton Down was arranged, 30 short specials being run on June 28, 29, and 30. The total number of vehicles dealt with at Clifton Down was 643, and, in addition, there were 61 special vehicles unloaded at Temple Meads with horses, carriages, and flowers, making a grand total of 704. The live-stock traffic was dealt with at Clifton Down station, and in spite of many difficulties the result was highly satisfactory. Machinery and kindred exhibits were conveyed by goods train. The number of trucks in which these were accommodated reached a total of 1,094, all of which were handled satisfactorily at Canon's Marsh. In connection with the return of the live-stock exhibits 25 special trains, consisting of 639 trucks, were despatched from Clifton Down between 8.13 p.m. July 5 and 11.5 p.m. July 6. In addition a number of excursion trains were run from different parts of the country.

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FRENCH Somaliland maintains its position as the most important avenue for trade with Abysinnia. The Franco-Ethiopean Railway is being pushed energetically forward and is expected to be open for general traffic to the Hawash River (331 miles from Jibuti) at the end of the present year. This will, says the British Consul, be a very great advantage to commerce. In the past goods have been brought up from the railhead at Dere Dawa by camel and mule transport, taking months on the journey, with considerable loss of life to drivers and animals in the unhealthy low country. The Hawash is 144 miles from Dere Dawa and 156 miles from Adis Ababa. In 1911 the total exports and imports by the railway were valued at 819,671*l.* For 1912, 588,924*l.* was the declared value of exports and imports by Jibuti. This sum included "railway material" valued at 6,528*l.* The weight in 1911 amounted to—exports 8,526 metric tons, imports 37,362 metric tons, being a total of 45,888 metric tons. In 1912 exports were 7,425 metric tons and imports 19,676 metric tons, total 27,101 metric tons. "Materials for railway construction" amounted to 23,697 metric tons in 1911 and to 4,289 metric tons in 1912. Figures of imports by the railways have been largely inflated in recent years by the supplies of food, material, etc., brought for the use of railway employés.

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THE fact that the Westinghouse brake still holds its own as regards the world's railways, though secondary in the United Kingdom is shown by some interesting statistics furnished by the Westinghouse Brake Company, covering orders for equipments to December 31, 1912. Considering only installations of 1,000 or more, the following figures for engines may be cited:—North, South and Central America, 81,524; Russia, 16,798; Germany, 15,294; France, 12,621; Great Britain, 5,852; Italy, 5,349; Belgium, 3,162; Australia, 2,894; Austria-Hungary, 1,768; Switzerland, 1,446; Holland, 1,058. Other countries account for smaller numbers, and the grand total for engines is 150,850. As regards carriages and wagons, America again heads the list with 2,637,781 equipments, Russia has 127,512, and the following five-figure totals may be mentioned:—Germany, 76,333; France, 66,388; Australia, 61,532; Great Britain, 47,659; Italy, 38,899; New Zealand, 19,118; Austria-Hungary, 18,821; Belgium, 12,906; Switzerland, 10,891. These together with smaller numbers give a grand total of 3,149,653 Westinghouse equipments on carriages and wagons.

* * *

IT is anticipated that the Charing Cross extension of the "Hampstead" section of the London Electric Railway will be opened for traffic by the end of the present year. The tunnel is being continued from the present down line to pass under the Charing Cross (District) station, and make a loop below the bed of the river, extending about 60 yards out. This loop makes almost a circle, and returns again under the Charing Cross District station, to the up tunnel of the Hampstead line. The new station under the Embankment will be at about the same level as the present Bakerloo

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station, and will be connected with it by a subway. To link these stations with the District Railway, two pairs of escalators are to be installed, opening on a circulating area under the present District station. When the work is finished it is estimated that 45 trains, instead of 43, as now, will be run per hour, saving five minutes in time on the present journeys.

* * *

THREE excellent additions have been made to the series of London and North Western Railway Company's splendid posters. "Visit the Lake District for delightful Scenery" is the text of one, which bears a large map of the Lake District showing the lakes, mountains and rivers, as well as the railway approaches. The other, of the same class but larger, reveals the geographical features of the Lleyn Peninsula, North Wales, with the railway systems of the London and North Western and Cambrian Railways, the main roads and motor omnibus routes. The presence of the Gulf Stream is indicated, in order to make it clear that Cardigan Bay resorts are suitable for autumn and winter visits as well as for summer holidays.

* * *

OFFICIAL contradiction has been given to the rumour circulated in some of the newspapers that the directors of the London and North Western Company have purchased the South Eastern and Chatham Railway for the sum of £90,000,000 sterling. It is not known how the story originated, but the prospect of a new line from London in connection with the Channel Tunnel, the rapid development of the Kent coal field and the appointment of two former London and North Western officers—Sir Frederick Harrison to the Managing Committee and Mr. Francis H. Dent as General Manager of the South Eastern and Chatham—may possibly have contributed to the suggestion, which we are assured is without foundation.

* * *

A CONTRACT has been placed with the McKenzie Holland and Westinghouse Power Signal Co., Ltd., by the Great Western Railway Company for an electro-pneumatic power signalling installation at Slough. This will be the first plant of the kind supplied on the Great Western Railway, other power installations on that line being all-electric. Motive power for actuating signal and point motors will be compressed air at a pressure of 70 lbs. per sq. inch, with electric control. The locking frame will have 17 working levers, and the air compressor will be steam driven from boilers at the Locomotive department, Slough.

* * *

GREAT improvements may be expected in the railway service between Havre and Paris as the result of the new line for goods traffic which is to be carried over the Seine at some point between Rouen and Havre. The great difficulty is to please both ports as to the manner by which the river shall be crossed. Rouen favours a tunnel, so that the navigation of the river for large vessels may not be impeded. The State railway authorities, however, propose a viaduct, to which the Havre interests are quite agreeable. The line will branch off at some point nearer Havre than Rouen and rejoin the main line between Rouen and Paris.

MUCH satisfaction has been expressed at the action of the Corporation of London in deciding to bear all the expense incurred in the promotion of the Bill which will enable local authorities to make out of the rates contributions towards the public acquisition of the Crystal Palace, at a total cost of £230,000. A board of control will now be formed, and a scheme drawn up for the maintenance of the property. The constitution of this authority, still to be determined, will include representatives of the whole of the contributing bodies, as also of the South Eastern and Chatham and London, Brighton and South Coast Railway Companies, which are so closely concerned in the future success of the Palace.

* * *

ALL the four British railway companies in Venezuela show improvement. The Venezuelan Central Railway Company, which is extending its line rapidly towards Santa Teresa, on the River Tuy, has recently opened a branch line to Los Dos Caminos, a village 8½ kiloms. from Caracas. To that place, as also to Petare, 10 kiloms. down the main line, the railway has been electrified. A branch to San Felipe is about to be made by the Bolivar Railway Company. On the Puerto Cabello and Valencia Railway traffic returns show improvement. The Macuto and Coast Line Railway Company's tramway between Maiquetía, a suburb of La Guaira, and Macuto, 5 miles long, is also to be electrified.

* * *

THE "Great Western Railway Magazine" states that in the lamp case of a staff-catcher at Llangollen station a blue titmouse has built its nest, hatched and reared a brood of seven. The only means of entering and leaving the lamp-case was through a hole at the top, no larger than a penny. A lamp, which had not been lighted during the spring, remained in the case, and the nest was built upon it. Not only do numerous trains pass daily within a foot or two of the place, but every time a train-staff is taken from the staff-catcher the lamp-case is given a sudden shaking accompanied by a loud clanging noise.

* * *

THE Pan-American Railway, forming part of the National Railways of Mexico, runs from San Geronimo, its junction with the Tehuantepec National Railway, to the Suchiate River, the boundary between the Republics of Mexico and Guatemala, thus traversing the whole length of the State of Chiapas. It is expected that it will soon be arranged to make connection with the Guatemalan railways at the border. Passengers will then be able to travel by rail from New York to Guatemala City, and eventually to the Isthmus of Panama.

* * *

IN the Board Room at London Road station, Manchester, the Challenge Shield and prizes won by the various teams in the annual Ambulance Competition held among the staff of the great Central Railway were presented by Colonel Sir Clement M. Royds, Mr. G. J. Gibson, district traffic manager, presided. Mr. H. C. Higson is ambulance secretary. Prizes were distributed as follow: Challenge Shield and First prizes, Wath Yard; Second prizes, Lincoln; Third prizes, Hull (C.P.); Fourth prizes, Gorton Loco.; Fifth prizes, Woodford (C. & W.).

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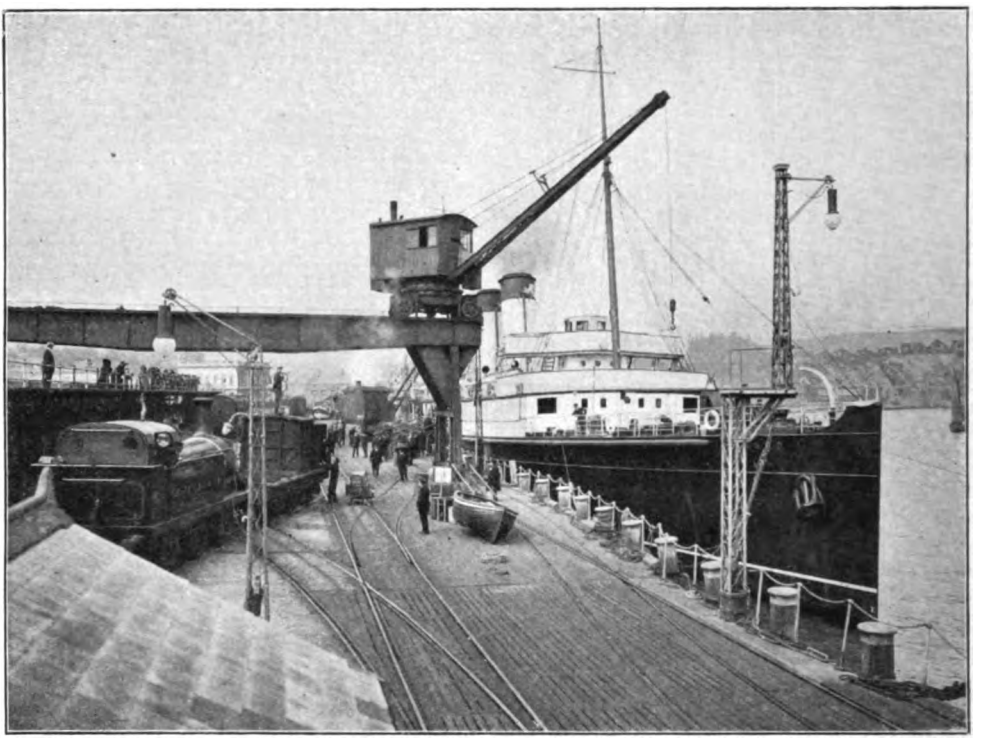

FOLKESTONE PIER: SOUTH EASTERN AND CHATHAM RAILWAY.
Turbine Steamer *Onward* alongside.

THE Mansfield Railway, a portion of which was opened for mineral traffic a few weeks ago, will give the Great Central Railway a new and shorter route between Nottingham, Leicester and London and Grimsby as well as placing the important town of Mansfield on a through route at the same time giving the almost undeveloped coalfield of this district access to the splendid dock facilities now available at Immingham. The Mnasfield Railway commences at Kirkby on the Great Central main line to London and terminates at Chipstone, on the Chesterfield and Lincoln section. The line is to be worked by the Great Central Company, and as showing the colliery importance of the railway it may be mentioned that the Bolsover Colliery Company has guaranteed a minimum traffic of 500,000 tons of coal from the Mansfield and Rufford pits to Grimsby and Immingham. There are also other important colliery companies in the district and several new pits are being sunk in view of the improved facilities now offered. The construction of the railway has involved some interesting engineering works, with about 40 bridges, a 2 mile cutting (largely through rock) and somewhat heavy earthworks, while the line has been laid out for heavy express and mineral traffic as it will afford a shorter and more direct route between the southern and eastern divisions of the Great Central Railway. Stations are being provided at Kirkby, Sutton-in-Ashfield and Mansfield. The Chairman of the Company is Mr. J. Plowright Houfton, J.P., Managing Director of the Bolsover Company, the other Directors being Mr. R. M. Knowles (Chairman of the Bolsover Company), Mr. T. Craven (a Director of the Cambrian Railways) and Mr. S. W. Pilling (a Director of the Wrexham and Ellesmere Railway). Mr. H. A. Sanders is Secretary. The line was laid out by and has been built under the supervision of Mr. R. E. Elliott-Cooper, President of the Institution of Civil Engineers.

* * *

THE reopening of the Invergarry and Fort Augustus Railway on August 1 was briefly announced in our last issue. Further particulars may be added. This railway was authorised in 1896, but for various reasons construction was delayed and it was not until July 22, 1903, that the line was opened for traffic. For four years the line was worked by the Highland Railway, though isolated from the rest of the Highland system. On May 1, 1907, working and maintenance were taken over by the North British Railway Company, with whose West Highland branch the Invergarry and Fort Augustus Railway connects at Spean Bridge, and this arrangement continued until the line was closed on October 31, 1911. The reopening of the line has only been accomplished after protracted negotiations, and by a guarantee being given by those who have agitated for the reopening to make up the deficit of £5,000, which represented the difference between the offer made by the North British Company and the sum which the Directors of the Invergarry Company were prepared to accept for the undertaking. There are four stations,

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viz.: Gairlochy, Invergarry, Aberchalder, and Fort Augustus, The extension from Fort Augustus to the Pier Station on Loch Ness is not being used in the meantime. Webb and Thompson's electric train staff apparatus is used for controlling traffic, with speaking and buzzer telephonic communication. Sidings at Invergloy and Aberchalder are controlled by Annett's keys. There are three trains each way daily between Spean Bridge and Fort Augustus during August and September. The line passes through lovely mountain and loch scenery, the difficulties of construction and maintenance partly accounting for its ill fortune in the past.

* * *

Photo] [*H. Fayle.*

COUNTY DONEGAL JOINT RAILWAY: 4–6–0 tank engine at Killibegs.

THE Brampton Railway, over which passenger traffic has not been worked since 1890, was reopened, under the control of the North Eastern Railway, on July 31. For particulars of this historic line reference may usefully be made to the RAILWAY MAGAZINE, May, 1910. Between Brampton Junction and the town station, a distance of 1 mile 8 chains, it has been relaid and Modernised to meet existing requirements. A girder bridge replaces the old stone bridge near the coal staith and at one difficult place the permanent way has been raised. The new Brampton station, near the coal staith, has a platform 160 ft. long and 15 ft. wide. In the centre are the booking and parcels offices, and waiting rooms. Considerable changes have also been made in the accommodation for coal and goods traffic. An autocar, consisting of an old tank engine and a composite vehicle, makes 38 journeys to connect with up and down trains calling at Brampton Junction. At the opening ceremony, station and trains were decorated, and there was a large assembly of railway officers and local residents. Sir Walter Plummer, a director of the North Eastern Railway Company, presided and Lady Cecilia Roberts opened the station gate by way of inauguration, after which the train made its first official journey to the Junction. At a public luncheon which followed, Mr. Lacy Thompson, a member of the family most closely associated with the fortunes of the Brampton Railway, gave a resumé of its history.

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THE Derwent Valley Light Railway was opened on Saturday, July 19. A provisional order was obtained by the Rural District Councils of Escrick and Riccall and the undertaking was eventually transferred to a company, of which the late Lord Wenlock was Chairman, the two local authorities mentioned retaining a financial interest in the undertaking. The railway commences at Cliffe Common, on the Selby and Market Weighton line, where there is a junction with the North-Eastern Railway, and it runs up the picturesque Vale of Derwent, on the west bank of the river, with stations at Skipwith, Thorganby, Wheldrake, Elvington, Murton, and Osbaldwick, terminating at York, where a large and well-equipped station has been erected in Hallfield Road. Messrs. Pethick, Dick, and Co., of Westminster, were the contractors, and the estimated cost of the line is £5,000 per mile. Ordinary passenger traffic started on Monday, July 21. The coaches and goods vehicles bear the Company's initials, but a North Eastern tank engine, No. 1679, is at present employed. Lady Deramore, wife of Lord Deramore, Chairman, performed the opening ceremony, and the first ticket—No. 000—was formally issued to her. Mr. J. L. Clewes, of the Midland Railway, is General Manager, his appointment dating from August last year.

TRAIN ON THE NORFOLK AND WESTERN RAILWAY, U.S.A.

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In order to dry painted vehicles quickly, the Pennsylvania Railroad is adopting the practice of "baking" its steel passenger carriages in a huge container, known as the "oven." The baking is to harden the paint on the car, both outside and inside. Cars treated thus, are said to last longer, look better, cost less, take less time to paint, and to be more sanitary. The oven is 90 ft. 3 in. long 13 ft. wide, and 15 ft. high. Each end has two large doors. The oven is lined on the inside with steel plate, and on the outside with galvanized iron. The 3 in. space is filled with magnesia lagging. Along the inside walls are placed 16 rows of 1¼ in. steam-pipes, and along the floor, close to the walls, are manifold castings with small lengths of pipe tapped in at right angles. By this means, over 2,000 sq. ft. of heating surface is provided. A steam pressure of approximately 100 pounds to the square inch is used, making it possible to get an oven temperature of over 250 degrees Fahrenheit. Ventilation supplies fresh air, which is required for the proper drying of paint, and provides for the egress of the volatile matter present. A track is placed on the floor of the oven and connected at each end of the oven with other, tracks leading into the regular paint-shop, where the different coats of paint (specially prepared with a view to the "baking" process) are applied. First, the car is primed all over, out and in, and baked for three hours. After partial cooling, the surfaces are glazed, and uneven spots are puttied. The car receives a surface coat, is baked again for three hours, and then removed for additional coats of paint. Finally, after the necessary decoration, there coats of varnish are applied, each being baked three hours. The car thus enters the oven and is withdrawn several times in the course of the process. All of the work done by the baking process of painting may be accomplished in six to eight days.

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Englishmen who have a hankering after railway nationalisation, says the *Daily Graphic*, may with advantage study the recent history of the Western of France Railway. This line, unlike most of the big French railways, has never been a profit-earning concern, and for many years the French taxpayer had to make good the guaranteed interest on the invested capital. It was largely on account of this fact that the French Government decided six years ago to take over the Chemin de Fer de l'Ouest while leaving the other railways still in the hands of companies. The taxpayer was promised that under State management the loss on the line would quickly disappear and the railway would yield a net return to the public exchequer. Exactly the contrary has happened. The loss, which was 27,000,000 francs in the last year of the company's working, has increased year by year and is now 85,700,000 francs, or in round figures three and a half million pounds. This huge deficit is not due to a falling off in traffic, for the Western of France Railway has shared in the general industrial activity of the world and traffic has greatly increased during the past few years. The loss is entirely due to the manner in which working expenses have been swollen under State management. Bureaucratic formalities have been duplicated or triplicated; officials have been multiplied; wages and salaries have been raised, not to meet legitimate demands, but in obedience to political pressure. Yet on no line in France have the employès been so restless and insubordinate, and on no line has the service given rise to so many complaints from the public. From every point of view the purchase has proved a failure.

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The turbine steamer *Stad Antwerpen*, the latest addition to the Belgium State Railway fleet engaged in the Dover-Ostend Continental service is the first channel steamer to be fitted with "Frahm" anti-rolling tanks. A companion vessel, the *Ville de Liege* will shortly be ready. Principal dimensions of these vessels are as follows:—Length between perpendiculars, 300 ft.; length over all 313 ft.; breadth of hull, 36 ft.; total length outside beam, 38 ft. 6 in. As in other turbine steamers of the fleet, the first-class saloons are placed in the fore, and the second-class and cabins of the crew in the after part of the ships. There are three steam turbines of the Parsons type, giving a speed of 24 knots. These steamers have been built expressly to make the passages *viâ* Dover and Ostend in connection with the new rapid services leaving London (Charing Cross) at 9 a.m. and 9 p.m. *viâ* Cologne to Berlin and *vice versa*, and in connection with the other fast services to Vienna and St. Petersburg. The *Stad Antwerpen* made her first public crossing on August 11 last.

* * *

Derby Locomotive Works, Midland Railway, will be visited on Wednesday, September 10, by the members of the Institution of Locomotive Engineers, of which association Mr. Henry Fowler, Chief Mechanical Engineer, Midland Railway, is President. The party will leave St. Pancras by the 11.35 a.m. restaurant car train, returning by the 8.0 p.m. from Derby, due in London at 10.40 p.m. Return fare 5s. Members from other districts will meet at the works entrance at 2.15. Further particulars can be obtained from the Secretary, Mr. G. F. Burtt, 46, Malling Street, Lewes. In consequence of his return to the United States, Mr. Lawford H. Fry, Baldwin Locomotive Works, has resigned his position as Vice-Chairman of the Institution, and the Council have elected Mr. W. A. Lelean, M.I.M.E., to succeed him.

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After adhering to eight-wheeled dining car designs for several years the Great Western Railway is introducing twelve-wheeled vehicles, having three saloons divided by partitions for 12, 18 and 12 passengers respectively. A further change is that fixed seats with lift-up arm rests are provided instead of chairs, while the tables are of mahogany covered with plate glass. The upholstery is of grey ribbed cloth with lace to match, and the internal equipment accords with the latest practice. Electric lighting and ventilating fans, with steam heating are provided.

* * *

Good progress is being made with the construction of the railway from Nice to Vievola, which will unite the French Riviera and the railway system of Northern Italy. Vievola, situate at the southern end of the Alpine tunnel near the Tenda Pass, over 5 miles in length, is

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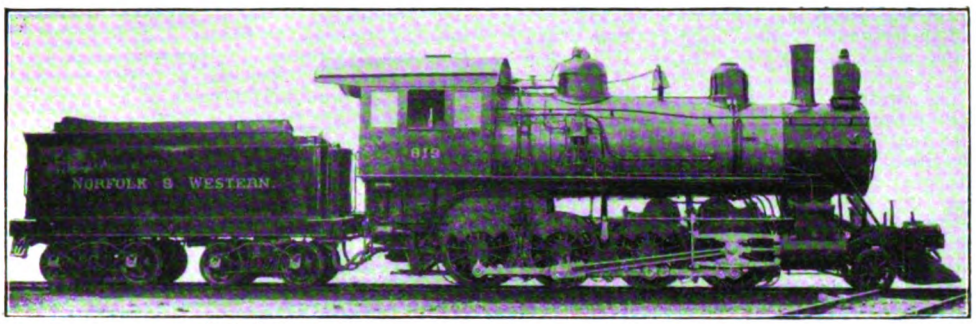

2–8–0 LOCOMOTIVE: NORFOLK AND WESTERN RAILWAY.
Constructed by the Baldwin Locomotive Works, Philadelphia.

the present terminus of the line to Turin *via* Cuneo. By the opening of the line from Nice to Vievola the distance by railway to Turin will be reduced from 179½ miles—as is at present the case *viâ* Ventimiglia and Savona—to 132 miles, the saving by the new route being thus 47½ miles.

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THE funicular railway in the island of Madeira, which formerly ended at Monte, has been carried 1,000 ft. higher, to Tarreiro de Luta, and is to be extended further. It is one of the few railways in the world upon which visitors have to pay much higher fares than residents. The charge for return tickets to Monte for residents is 1s. 8d., for tourists 4s.; to Terreiro de Luta for residents 2s. 6d., for tourists 6s. and there is only one class. This differentiation is strongly condemned by tourists.

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A READER in Toronto sends a photograph of one of the largest "box cars" running on American and Canadian railways. The length inside is 50 ft., breadth 8 ft. 7 in., height 10 ft., the average car of this type in Canada being 36 ft. long, 8½ ft. high, and 8½ ft. wide. The same correspondent also forwards a view of the offices of the Canadian Pacific Railway in Toronto, which is said to be the highest office building in the British Empire. It is 200 ft. high, and there are 15 storeys.

MR. M. F. RYAN, resident locomotive superintendent of the Somerset and Dorset Joint Railway, appointed assistant to Mr. W. M. Urie, Chief Mechanical Engineer, London and South Western Railway, is succeeded by Mr. R. C. Archbutt of the chief mechanical engineer's department of the Midland Railway at Derby. Mr. J. E. Anderson, chief draughtsman in the chief mechanical engineer's department, Midland Railway, has been appointed Works Assistant in the same division, and Mr. Sandham J. Symes takes his place as chief draughtsman. Mr. W. H. Christy Clay has been appointed Estate Agent to the Midland Railway Company, succeeding Mr. P. S. McCallum, who retires after occupying this position for nearly a quarter of a century.

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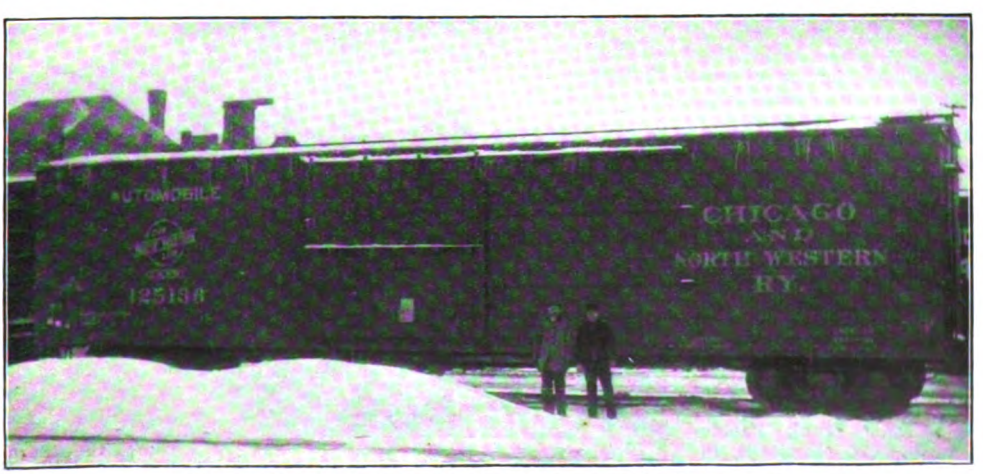
To supplement the particulars given in our last issue relating to the rolling stock of the Freshwater, Yarmouth and Newport Railway, we may add that the Manning Wardle saddle-tank engine is of the 0–6–0 type with 15 in. by 22 in. cylinders. There are seven four-wheeled coaches from the Manchester, South Junction and Altrincham Railway and five similar vehicles with some goods wagons and cattle trucks from the Isle of Wight Central Railway. The passenger station at Newport is on the curve near the junction with the Isle of Wight Central Railway



50 FT. BOX CAR: CHICAGO AND NORTH WESTERN RAILWAY.

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and a few yards further west sidings are being laid in for goods traffic. The vacuum brake is in use on the railway.

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THE summer issue of "The Homestead," the well-known periodical publication prepared by the Great Central and Metropolitan Railways, effectively maintains the characteristics of previous numbers and is distinctive on its own account. It is a combination of an illustrated "A.B.C. Residental Gazette and Property Register," a suburban time table and a guide to the districts within 40 or 50 miles of London served by the Great Central and Metropolitan Railways.

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PRIZES for horticultural decoration on the Underground Railways have this year been awarded as follows:—First prizes, Northfields, Boston Manor, and South Kensington. Second prizes, St. James's Park, West Kensington Incline, and Hounslow Barracks. Third prizes, Walham-green, Ealing-common, South Ealing, Lillie Bridge, Acton Town, Whitechapel, South Kensington, Parson's-green, and North Ealing.

* * *

SIR ARTHUR YORKE, late Chief Inspector of Railways for the Board of Trade, has been elected to the board of the London, Chatham and Dover Railway Company in the place of the late Mr. George Wyndham, M.P. We congratulate the directors on this valuable addition to their strength.

* * *

MR. FELIX J. C. POLE has been appointed Chief Clerk to Mr. Frank Potter, the General Manager of the Great Western Railway. He will continue to act as Secretary of the company's side of the Great Western Railway Conciliation Boards and as editor of the company's magazine.

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A LOCOMOTIVE search-light of distinct merit was exhibited by Messrs. R. Terrell & Company, of 9, Regent Street, at the Commercial Motor Exhibition, Olympia, the special feature being that it is cast of aluminium, no rivets, solder, or sweated joints being used in its construction. It is fitted with a special ground Mangin lens mirror of exceptional power. For strength and simplicity the lamp seems to be one of the best on the market.

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MR. C. E. DEWEY has been appointed freight traffic manager of the Grand Trunk Railway, in succession to Mr. C. A. Hayes, who resigned to accept service with Government Railways. Mr. A. E. Rosevear becomes general freight agent of the Grand Trunk Pacific Railway and Grand Trunk Pacific Steamship Co. (Limited), in the place of Mr. C. E. Dewey.

IN addition to their ordinary business of insuring railway travellers, the Railway Passengers' Assurance Company assures against other accidents. Recently a cyclist skidded on a wet road and fell in front of a tramcar, receiving injuries which resulted in death a few hours later. Fortunately he was insured for £1,000 with the Railway Passengers' Assurance Company, who immediately admitted their liability to pay this sum.

* * *

MR. R. RIGBY, assistant accountant, Great Central Railway, has been appointed Chief Accountant in place of Mr. F. Williams, who retires after holding that position for 26 years. Mr. S. Rowbottom becomes Assistant Accountant and Secretary to the Hotels Committee, Great Central Railway, while Mr. H. M. Bowden has been appointed to a new office as Audit Accountant.

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WE understand that Mr. F. W. Hutchinson, Traffic Manager (since 1895) and Secretary (since 1907) of the Portpatrick and Wigtownshire Joint Railway and Secretary of the Larne and Stranraer Steamship Joint Committee, will retire at the end of this year, and be succeeded by Mr. W. McConchie, at present traffic manager of the Larne and Stranraer steamers.

* * *

LORD TREDEGAR has joined the board of the Brecon and Merthyr Railway in place of the late Mr. E. M. Underdown, K.C. Mr. F. L. Steel has been appointed Deputy Chairman of the Great Northern Railway Company in place of Sir Lesley Probyn, who has retired from this position

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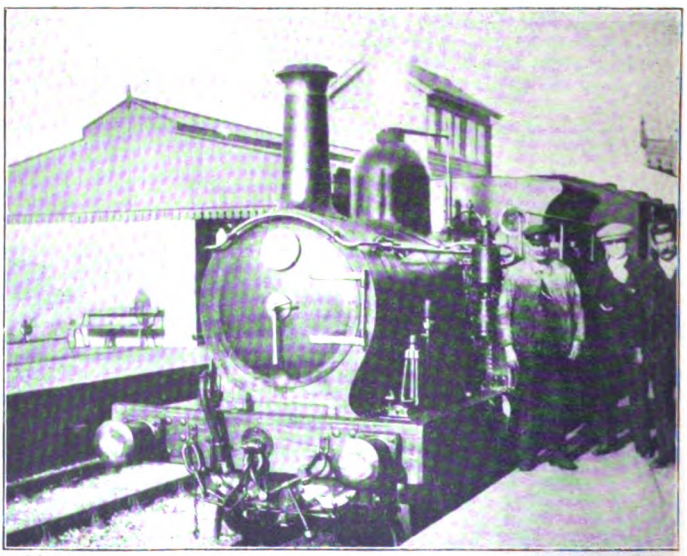
ANOTHER of the Midland Company's large 4–4–0 non-compound type, No. 519, has been acquired temporarily by the Somerset and Dorset Joint Railway for the more expeditious working of their summer traffic.



Photo] [*G. M. Miskin.*

ISLE OF WIGHT RAILWAY:
Ventnor Train at Sandown.

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NORTHFIELDS STATION : METROPOLITAN DISTRICT RAILWAY.
This station obtained a first prize for horticultural decoration.

FROM the North to the "Sunny South" is the text of two new posters issued from Euston. Differently coloured, the general scheme is the same, with a map in the centre surrounded by bold lettering setting forth facilities afforded by the London and North Western for travel in through trains or through carriages between Manchester and other northern and midland towns, and Brighton and Eastbourne in the one case and Folkestone, Dover and Deal in the other. Attention is drawn to the fact that refreshment cars are available between Manchester and Eastbourne and between Crewe and Willesden on the respective services.

* * *

THE "Intermediate" 4–4–0 engines of the 883 class, North British Railway, are being amplified by a further series of ten engines now under construction at Cowlairs, and which will be named after famous Glens in the West Highlands. Five are being fitted with the Robinson and five with the Schmidt superheater, and the cylinders will be increased to 20 in. diameter, but in other respects they will be somewhat similar to Mr. Reid's present 19 in. by 26 in. "Intermediate" engines. The numbers and names will be as follows:—No. 149, *Glen Finnan*; No. 221, *Glen Orchy*; No. 256, *Glen Douglas*; No. 258, *Glen Roy*; No. 266, *Glen Falloch*; No. 307, *Glen Nevis*; No. 405, *Glen Spean*; No. 406, *Glen Croe*; No. 407, *Glen Beasdale*; and No. 408, *Glen Sloy*.

HITHERTO superheating apparatus has been applied mainly to new engines, but it is now being fitted extensively to older classes as re-boilering and other requirements have justified that course. On the North Eastern Railway various 4–4–0 locomotives, including some of earlier series, are being fitted with the Schmidt apparatus. On the London and North Western Railway, further "Precursors" are being similarly adapted. No. 2664, *Queen Mary*, has also been fitted. Mr. Gresley is altering several of the ordinary "Atlantics," and on the Great Eastern Mr. A. J. Hill is using the same apparatus for some of the rebuilt 4–4–0 engines. On the Great Western and Great Central Railways such conversions are becoming standard practice.

* * *

AN interesting series of articles on railway station architecture appears in our contemporary *The Architect and Contract Reporter*, the author being Mr. M. S. Briggs. Considerable research is evidenced, and many interesting facts concerning early stations are presented, together with architectural criticisms of the principal modern terminal and roadside stations.

* * *

THE station hitherto known as "Stirchley (for Dawley)," on the Wellington, Oakengates and Coalport branch of the London and North Western Railway, will in future be known as "Stirchley."

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Railway and other Literature.

LOCOMOTIVE RUNNING SHED NOTES. [Locomotive Publishing Co., Ltd., London, E.C.] This volume is a companion to that previously issued from the same office entitled "Locomotive Shop Notes." The earlier book was based upon articles published during the past few years in the pages of the *Locomotive Magazine* relating to matters arising in the construction of locomotives and the work generally of locomotive workshops. The present volume is complementary to those notes. Its contents are drawn from the same source. The subjects treated relate to stages in the science and art of locomotive engineering, which in point of time both precede and follow the stage dealt with in the "Shop Notes," namely, the design and working of locomotives. Written by practical men familiar with the subjects in hand, the articles are as fully illustrated and carefully revised as were those of the companion series. The book can be purchased at the office of the RAILWAY MAGAZINE at published price (2s. 6d. net), or obtained therefrom by post, 2s. 9d.

RAILROAD CONSTRUCTION. [By Charles L. Crandall, M.C.E. (Professor of Railroad Engineering, Cornell University), and Fred. A. Barnes, M.C.E. (Assistant Professor of Railroad Engineering, Cornell University). Hill Publishing Co., Ltd., 6, Bouverie Street, E.C. Price 12s. 6d. net, post paid.] This work is developed from a series of notes, reproduced in mimeograph form about 25 years ago, for the use of students in the College of Civil Engineering at Cornell University. The notes have been revised and amplified, and with the addition of further material provide a comprehensive treatise on methods, costs and equipment needed for all branches of railroad engineering, from earthwork and rock excavation to culvert, bridge, and roadbed construction. Each chapter is accompanied by a list of references and a complete bibliography. Designed as a text book, the volume contains much material of value to engineers in regard to estimates and preliminary surveys, as well as to actual construction.

THE STUDENT'S GUIDE TO RAILWAY LAW.—[By A. E. Chapman, M.A., LL.D. (Cambridge). Lecturer on Law in the University of Leeds and Barrister-at-Law, of the Middle Temple. Published by Sir Isaac Pitman & Sons, Ltd. Price, 2s. 6d. net.] This work is described as a manual of information for traders, passengers and railway students, and is intended to present a general view of the main features of the subject. A short chapter has been inserted on shipping law in connection with railway companies, and a brief outline of legal practice has also been written. Chapters are added on the rating of railways and on canals held or controlled by railway companies. Questions on the subject-matter of each chapter are suggested with the view to enable the reader to fix items in his memory, and to help the student who contemplates entering for an examination.

MODERN RAILWAY WORKING. THE fifth volume [Gresham Publishing Co.] is issued. Mr. Thomas Nash is responsible for a valuable chapter on tests of materials used in locomotive construction. Mr. Walter Chalmers, Chief Draughtsman, North British Railway, is the author of a chapter on locomotive maintenance and repair, and Mr. Surrey Warner, Carriage and Wagon Superintendent, London and South Western Railway, contributes a section on the design and construction of carriages and wagons. Presented with this volume is a sectional cardboard model showing the construction of a modern locomotive. Hitherto such models have usually applied to continental designs, but in this case a London and North Western *George the Fifth* superheater engine provides subject matter though no indication is given as to the railway or class of engine.

PITMAN'S RAILWAY (Rebates) CASE LAW. By G. B. Lissenden. [Sir Isaac Pitman & Sons, Ltd. 10s. 6d. net.] This volume, described as a book of reference for traders, railway officials, and solicitors, contains the judgment of the court in every rebate case submitted to the commissioners. It is claimed that in its preparation something new has been attempted—to provide for all those interested a handy collection of the numerous test cases on the subject of railway rebates, so that for a purely nominal fee, every railway trader shall be able to have a leading counsel always at hand to consult at will.

THE WONDER BOOK OF SHIPS. [By Harry Golding. Published by Messrs. Ward, Lock & Co. Boards, 3s. 6d.; cloth gilt, 5s.] A companion to the "Wonder Book of Railways" and other similar publications issued by the same firm, this volume well maintains the favourable characteristics of its predecessors. Profusely illustrated, it is designed for presentation purposes and for youthful readers, but contains a great deal of information which will be appreciated by children of older growth.

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THE
JOHN CRERAR
LIBRARY

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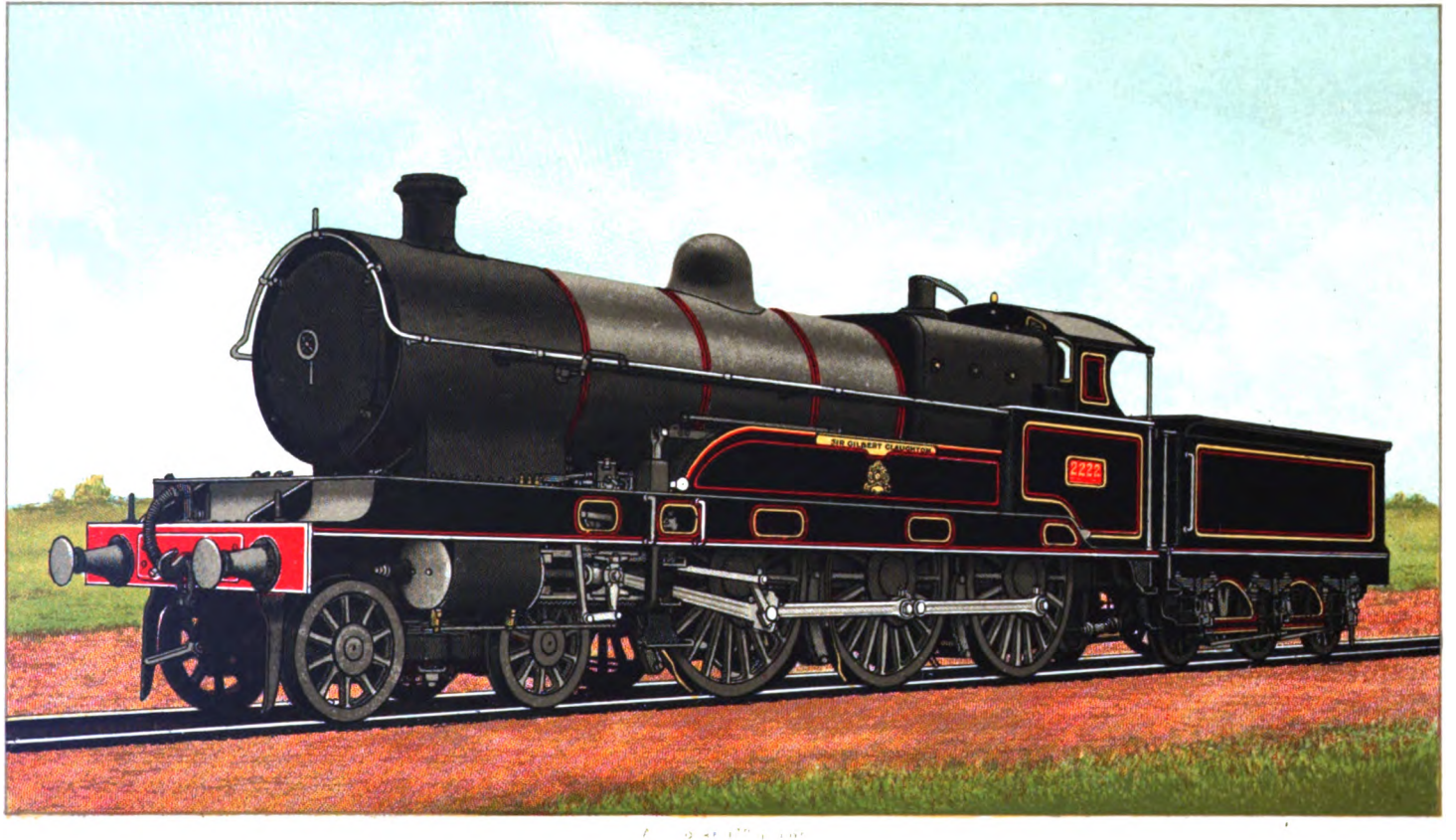

LONDON AND NORTH WESTERN RAILWAY FOUR-CYLINDER SIX-COUPLED EXPRESS LOCOMOTIVE.
No. 2222, "SIR GILBERT CLAUGHTON."

FITTED WITH SCHMIDT SUPERHEATER. DESIGNED BY MR. C. J. BOWEN COOKE

CYLINDERS (4), 16IN. DIAMETER, 26IN. STROKE. DIAMETER OF COUPLED WHEELS, 6FT. 9IN. STEAM PRESSURE, 175LBS. PER SQ. IN.
TOTAL HEATING SURFACE, 2232 SQ. FT. GRATE AREA 30.5 SQ. FT.
WEIGHT OF ENGINE AND TENDER IN WORKING ORDER 117 TON.

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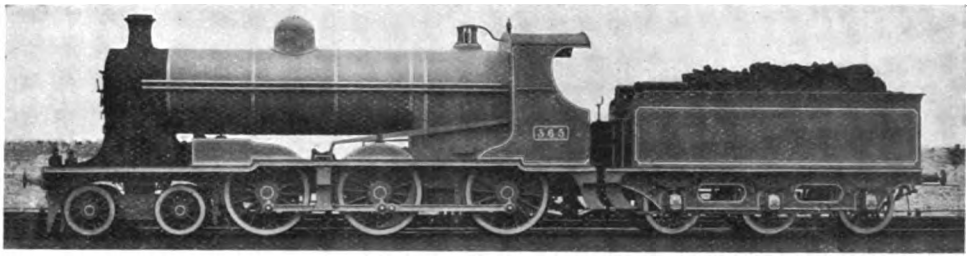

4–6–0 GOODS LOCOMOTIVE: GREAT SOUTHERN AND WESTERN RAILWAY, IRELAND.

Inchicore Works: Great Southern and Western Railway (Ireland).

By J. F. GAIRNS.

ALTHOUGH it can hardly be called a "railway town," the suburb of Inchicore, on the west of Dublin, is to all intents and purposes a railway colony. Here, on an estate of 87 acres—all belonging to the Great Southern and Western Railway Company—are located the locomotive carriage and wagon works which find employment for about 1,400 men and boys; the permanent way and signal shops belonging to the Permanent Way Engineer's Department, with a staff of about 200; the Stores Department, from which the works and the whole of the system is supplied, accounting for another 100 or so employés; the running and carriage sheds; carriage and goods sidings alongside the main line which skirts the railway area; with several streets of pleasant-looking and well-built houses and an Institute built by the Company for the works and running staff located at Inchicore. Including families the railway colony houses about 500 individuals, while employment is provided for some 2,000 men and boys and a few women, though not all of them actually reside on railway property, there being, as may be expected, a proportion who use the tramway (which terminates not far away), or cycle to and fro, or travel by the staff trains run at suitable hours to and from the Kingsbridge terminus.

As the largest railway company in Ireland, it follows that the operations of the Great Southern and Western Railway constitute an important factor in the industrial life of Dublin. With rolling stock consisting of 283 locomotives, 885 passenger train vehicles and 7,852 goods vehicles of various kinds it follows that Mr. R. E. L. Maunsell's staff at Inchicore, with a few sub-shops and repair shops for minor work at out-stations, is kept busy, especially as work is also done for other departments, though the permanent way and signal departments have their own premises, as already mentioned. Moreover, virtually all locomotives, carriages and goods vehicles are constructed here, outside orders only being given when the works cannot undertake them. It is over twelve years since any new locomotives were purchased outside. Mr. Maunsell also has charge of the running staffs for engines, carriages and wagons, as well as the maintenance of stationary plant, power cranes, capstans and all mechanical appliances.

But apart from their importance as the largest railway works in Ireland, Inchicore is the only establishment in the western island which has its own iron foundry, though steel castings are still ordered outside in common with many English Railways. It shares with Swindon Works, Great Western Railway, the distinction of being the only railway shops where steam stamps are used in the smithy instead of drop stamps. The running shed is, perhaps, the most architecturally picturesque building devoted to the accommodation of locomotives in the world. The rolling stock of the Great Southern and Western Railway also provides features of interest, in that it includes the only 4–6–0 and 2–6–0 tender locomotives in Ireland, and it will shortly possess the only three-cylinder engine working there, while the adoption of the Walschaert valve gear, though not unknown in Ireland (it is used on the Northern Counties section of the Midland Railway and for a few narrow gauge engines elsewhere), is a notable development of practice.

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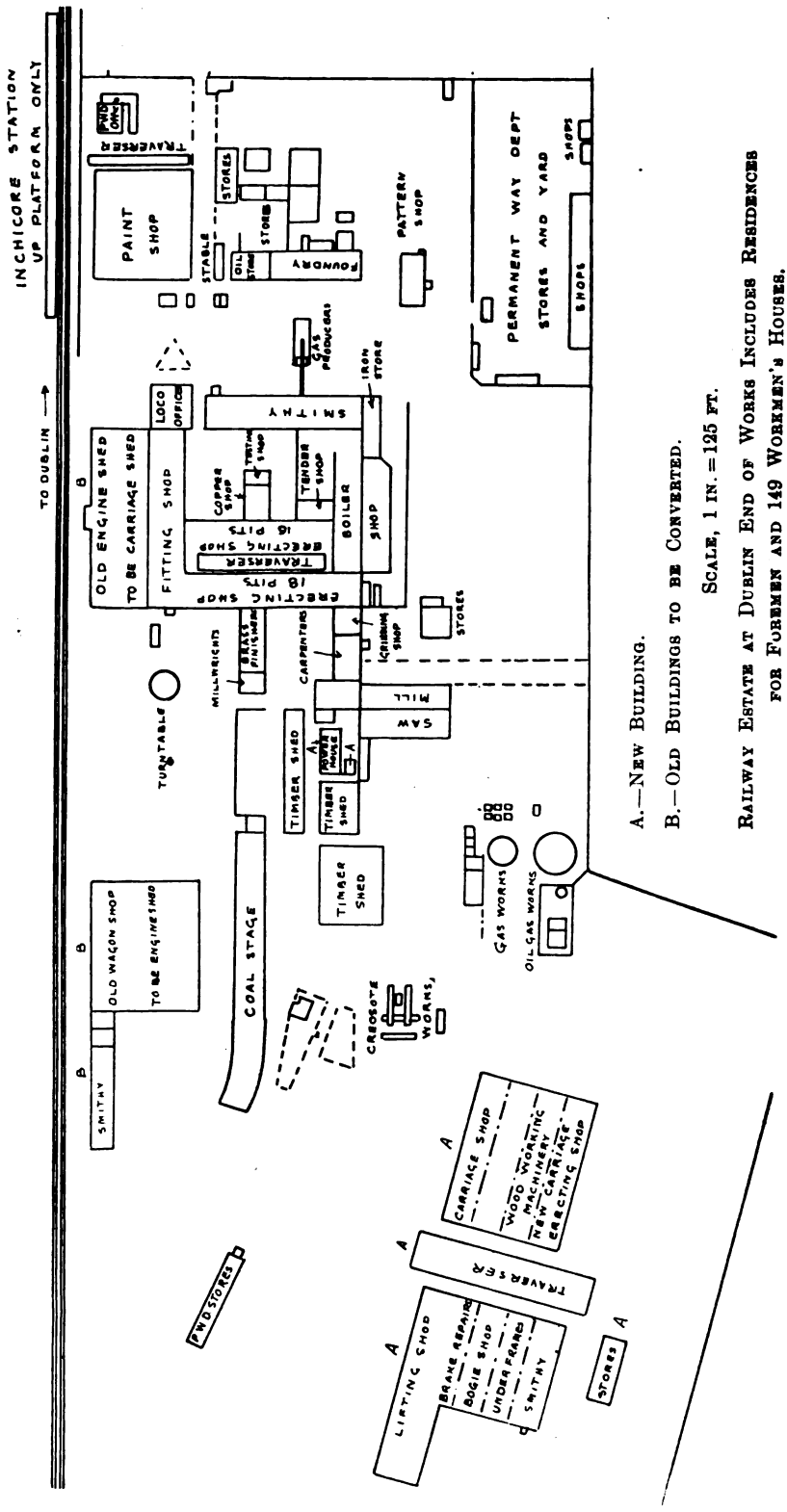

A.—New Building.

B.—Old Buildings to be Converted.

Scale, 1 in. = 125 ft.

Railway Estate at Dublin End of Works Includes Residences for Foremen and 149 Workmen's Houses.

Inchicore Works, Dublin: Great Southern and Western Railway.

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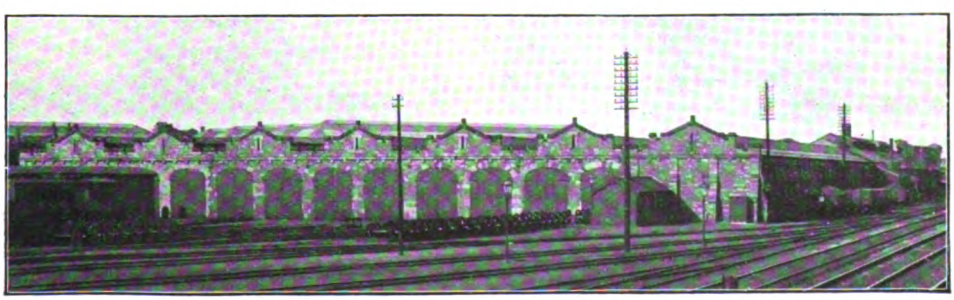
NEW CARRIAGE SHOP.

It will therefore be seen that, while the great railway works of England and Scotland may be the scene of railway mechanical engineering in its highest development and may find employment on the largest scale, yet, in view of the conditions in the sister isle and the relative magnitude of railway operations there, Inchicore is well worthy to be reckoned among the great railway shops of the United Kingdom. Somewhat extensive re-arrangements and enlargements, including several new shops, are in progress, and therefore, instead of a complete plan showing railway tracks, a general plan of the buildings is given. For this we are indebted to Mr. R. E. L. Maunsell, Locomotive Carriage and Wagon Superintendent, and at this stage acknowledgement may be made of his courtesy and co-operation in reference to the preparation of this article, and in arranging for photographs to be specially taken ; of the assistance of Mr. MacNamara, the Company's chemist and chief of the testing department, who has also acted as photographer ; of the services of Mr. Hutchinson, who constituted an admirable guide and conductor during my inspection of the works ; and of courtesies rendered by other members of the staff.

A few minutes' walk from the Inchicore tramway terminus leads to the railway estate. Here are 149 houses belonging to the railway company, arranged in streets, with public gardens, a large Institute, Dining Hall and Library, and with several foremen's houses in the corner adjoining the works. All the houses are of the usual grey stone, neatly designed, with gardens back and front. The Institute also accommodates what is known as the " sewing class "—a number of women and girls being employed there in making uniforms for railway servants. Following the curved road to the main entrance, and passing the paint shop and smaller divisions on the right and stables and stores on the left, with time and pay offices at the end of this road, the actual works area is reached. An open space, partly used for storing boilers, ironwork and castings gives a good view of the works buildings. In front of the locomotive offices is a triangular grass plot with a stone pedestal on which is mounted one of the original " Bury " locomotives employed in the very early days of the railway.

With its ivy-clad walls, the office building attracts attention at once, though it is a very plain erection architecturally. On the ground floor are the offices belonging to the stores department and the gas engineer. The first floor contains Mr. Maunsell's private office, that of his chief clerk (Mr. G. D. M. Beard), and clerical staff, a large drawing office, where the chief draughtsman (Mr. E. E. Joynt) is assisted by four senior and five junior draughtsmen, and offices for the Works Manager (Mr. E. A. Watson), Locomotive Accountant (Mr. J. Harrington),



OLD CARRIAGE SHOP.

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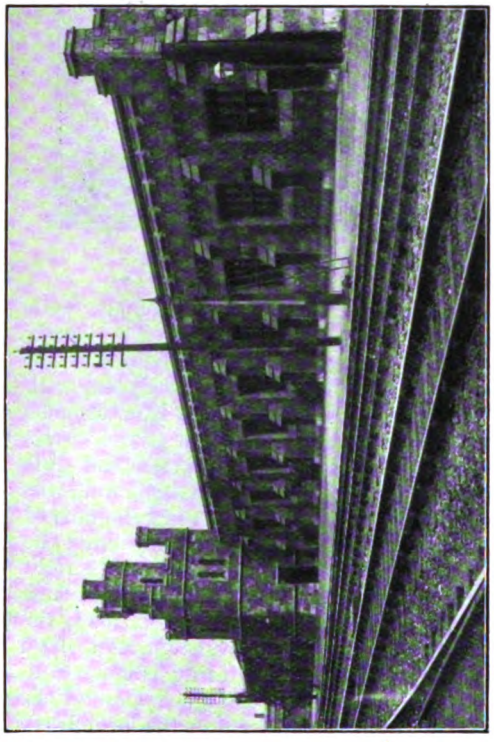
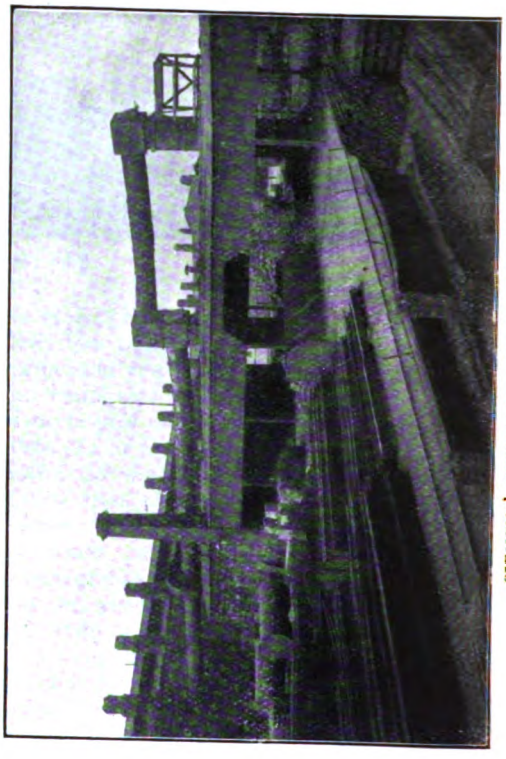
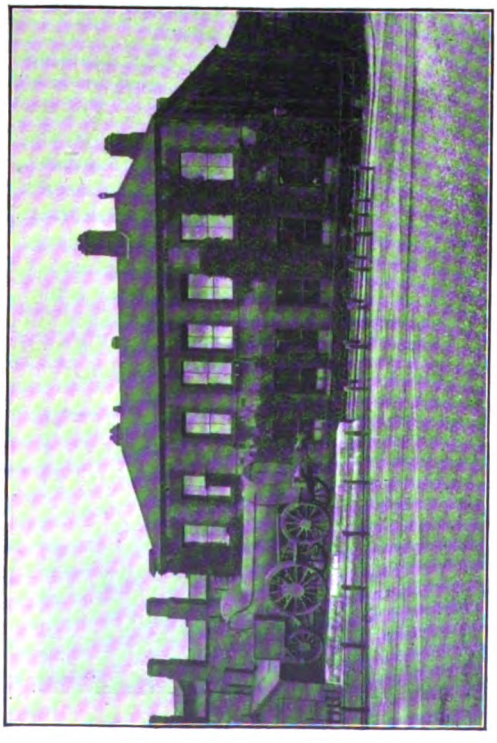


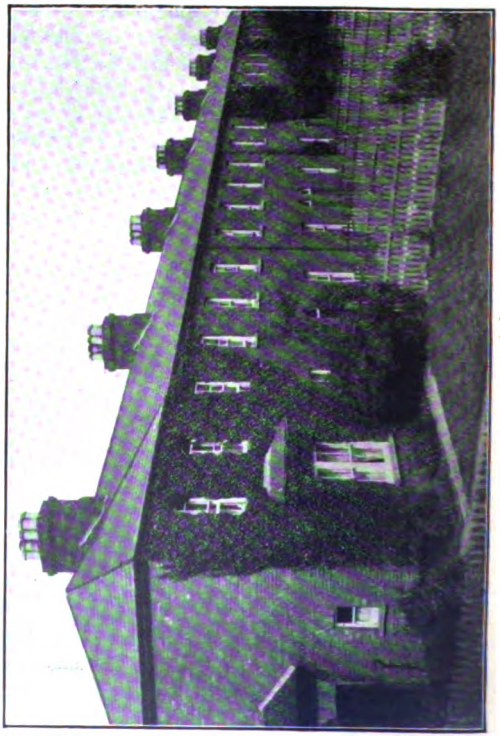
RUNNING SHED.



SIEMENS' FURNACE AND GAS PRODUCERS.



OFFICE BUILDING.



RAILWAY EMPLOYÉS' HOUSES.

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and Running Superintendent (Mr. H. W. Crosthwait). Altogether about 60 people are accommodated in this building.

At the side of the locomotive offices an archway is traversed and the fitting and machine shop entered. This is 324 ft. long and 50 ft. wide. Machines are arranged on either side of a central arcade, a rope-driven walking crane running down the middle, while a few hand, wall and pillar cranes meet other lifting requirements. Narrow-gauge tramways down the centre of this shop and in other divisions of the works are used for hand trolleys on which parts and materials are conveyed as required.

Starting from the office end of the building several machines on the right-hand side may be mentioned. First comes a single-cylinder boring machine, a big Bateman duplex cylinder planer, several slotters and drills, and a horizontal slot driller by Smith and Coventry. Near by is an old double head slot drilling machine, a duplex planer, an Alfred Herbert horizontal milling machine, and a few other tools. A transverse passageway provides communication with the erecting shop alongside, and beyond this may be noted various slotting machines, lathes and drills, a Beyer-Peacock "lapping-out" machine, a new Muir shaping machine, several drills mounted on pillars, a large Muir vertical miller and a slide bar grinding machine. At the further end are placed the heavy tools, including a Muir machine for milling bogie and other frame plates of moderate length, a large Whitworth radial drill for frame plates (plates for a 40-ton well wagon were being machined thereon at the time of my visit), a big double head frame slotting machine, a large Hetherington slotter, a big duplex planer, a Smith and Coventry horizontal milling machine, an old Beyer-Peacock long-table duplex planer, and various boring, tyre facing and other machines. In the corner is an old pumping engine not now used, and on the adjacent walls are mounted two wall engines, one driving the shafting of the fitting shop directly, the other operating a line of shafting along the erecting shop, part of which is here at right angles, bevel gearing being introduced to connect the two sets of shafting and to enable the power of both engines to be associated for driving the whole of the shafting of these divisions.

Returning to the office end of the fitting shop the left-hand side may be followed. First may be noted a machine for facing up

ENGINEMEN'S DORMITORY.

valves and pipe ends and for milling out ports of cylinders; a small semi-automatic lathe; and along the wall a separating machine for obtaining oil from cuttings and turnings; two Alfred Herbert automatic staybolt machines, two automatic turning machines for more general work, and a few ordinary lathes of small or medium sizes. Beyond are several small lathes (operated by apprentices), drills and a series of benches for the fitters. Across the passage way leading into the erecting shop other benches are placed and these are used for erecting motion plates, attaching brackets for the rocking shafts of valve gear for superheater and piston valve engines, and for other purposes. Further along is a new Redman duplex planing machine with the change speed gear head above, an American boring mill, a vertical milling machine, and a series of wheel and crank axle lathes of various sizes. There are really two erecting shops, with a traverser (operated from the shop shafting by worm gearing and endless steel rope) between. Both are at right angles to the fitting shop. That at the end has 18 transverse roads and is served by two Craven 50-ton rope-driven cranes. A portion is devoted to erecting tender frames and mounting boilers. The other section has 16 pits and similar crane power.

Engines are brought into the building by one of the transverse roads, and then transferred by means of the traverser as required. In suitable positions about the erecting shop are a few tools (for which the transverse shop shafting already referred to is provided), and a gas ring for shrinking on tyres and crank sections. Built up crank shafts are now standard practice on the Great Southern and Western Railway. Outside these buildings are several auxiliary departments, including a boiler house for supplying the shop engines referred to, and a shed for steaming boilers.

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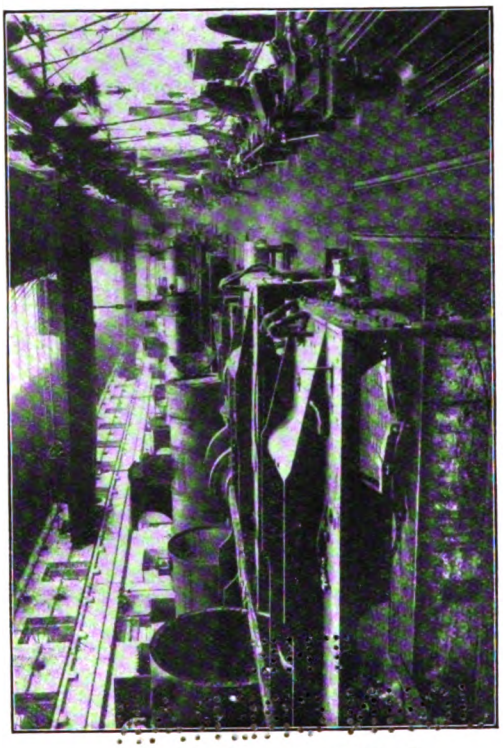
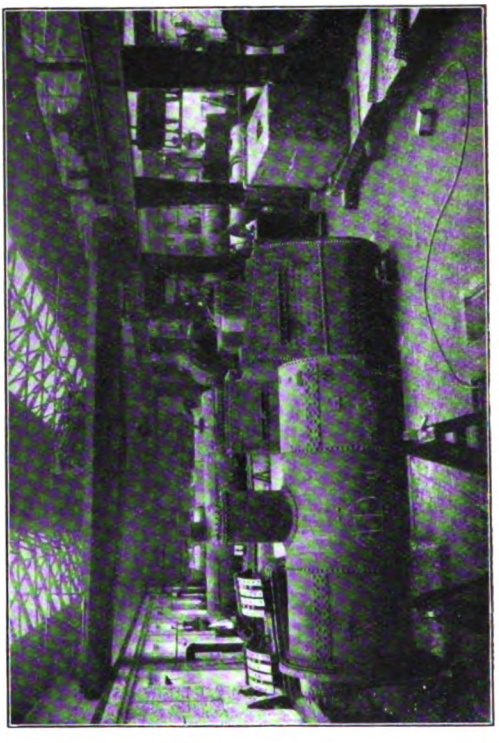
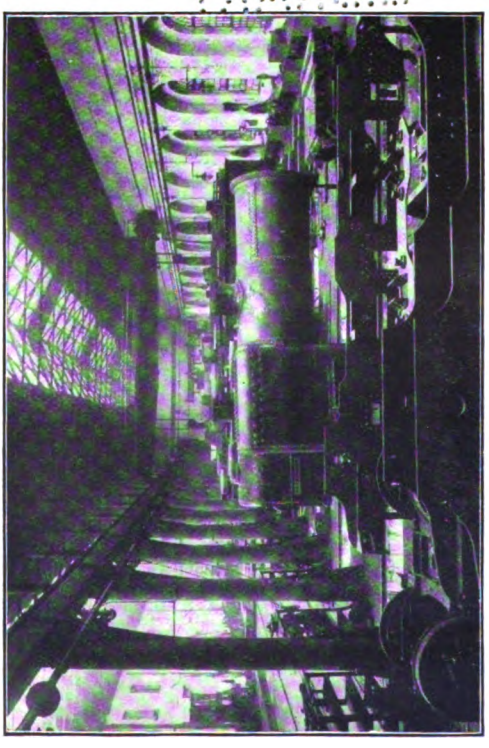


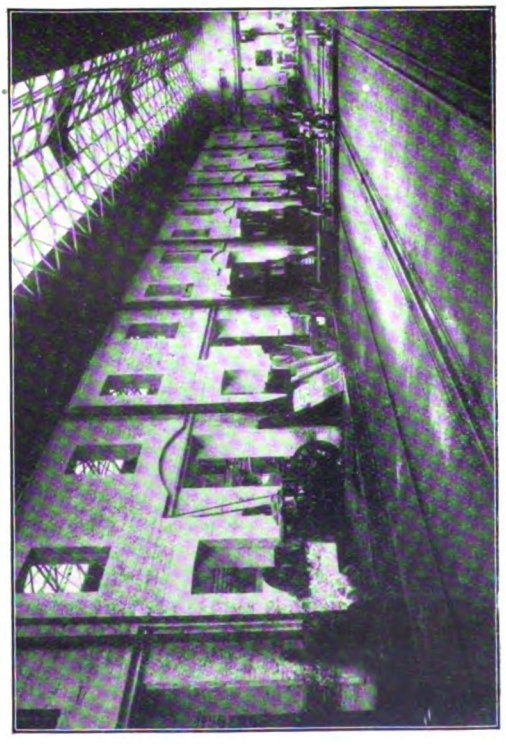
ERECTING SHOP: OLD BAY.



BOILER SHOP.



ERECTING SHOP: NEW BAY.



ENGINE TRAVERSER BETWEEN ERECTING SHOPS.

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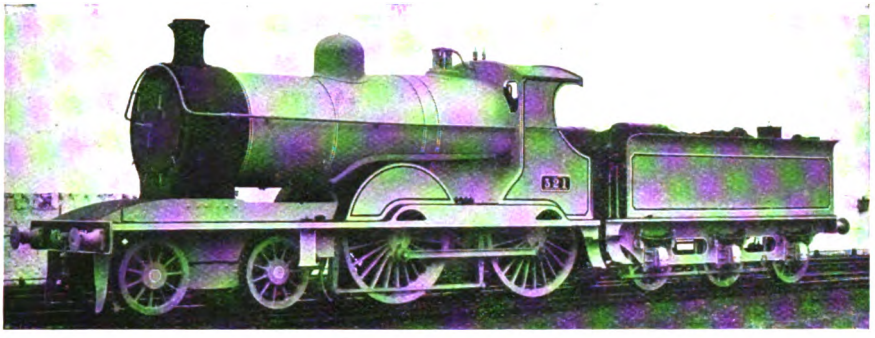
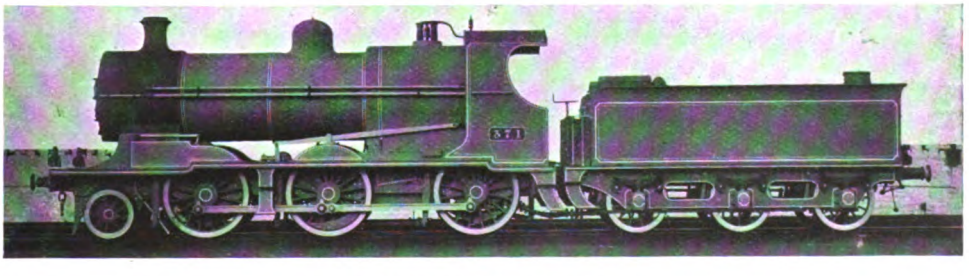


4–4–0 EXPRESS LOCOMOTIVE.

The boiler shop is 220 ft. long and 80 ft. wide for most of its length. At the end is a rivetting tower served by Fielding and Platt (Tweddell's system) appliances. A portable hydraulic rivetter, and various pneumatic rivetting and caulking tools are also included in the equipment. The tools include a Whitworth radial drill, a horizontal drill for the flanges of tube sheets, punches and shears, various drills, edge planers for boiler plates and plate rolls. Electric power is used in this shop for driving machines. There are three 10-ton overhead cranes, one situated in a small power house adjoining the boiler shop; air compressors and hydraulic pumps. At the end of this shop tank work is done, as also special items, such as iron roofs for wagons, and side sheets for metal superstructures. Beyond this shop are the smithy and forge. At one end a portion forms the screwing shop, with various screwing and tapping machines, and adjacent are two sawing machines, two small hacksaws, a triple stay screwing machine, a Henry Pels special bar cropping machine, two Horsfall forging machines, Ryder hammers, a planing machine for use in making dies, and nut making machines. The small furnaces for this division and elsewhere about the smithy and forge are usually coal or coke fired. At present the demands at Inchicore have not justified the provision of a big hydraulic press for flanging throat plates and tube sheets. This work is therefore still done by hand upon flanging blocks, a special coal furnace being provided adjacent thereto. Another division forms the spring shop, where are installed a series of Craven machines for cutting, notching and knibbing plate springs, a Buckton spring testing machine and other appliances.

There are altogether six steam hammers in the smithy and forge. The big scrapping hammer (50 cwt.) is served by two Siemens gas furnaces supplied from the Siemens gas producers outside. Along the middle of the smithy are five smaller steam hammers. Along the walls and elsewhere as required are 34 smiths' hearths and fires. Near the middle of this section are the steam stamps mentioned as being only found elsewhere at Swindon, Great Western Railway, as regards railway shops. They are by Messrs. B. and S. Massey, and are designed to carry out the same class of work as is usually done with drop stamps. It is claimed, however, that the results are superior in that direct pressure is associated with impact. Alongside is a "finning" machine. Near the wall



2–6–0 GOODS LOCOMOTIVE.

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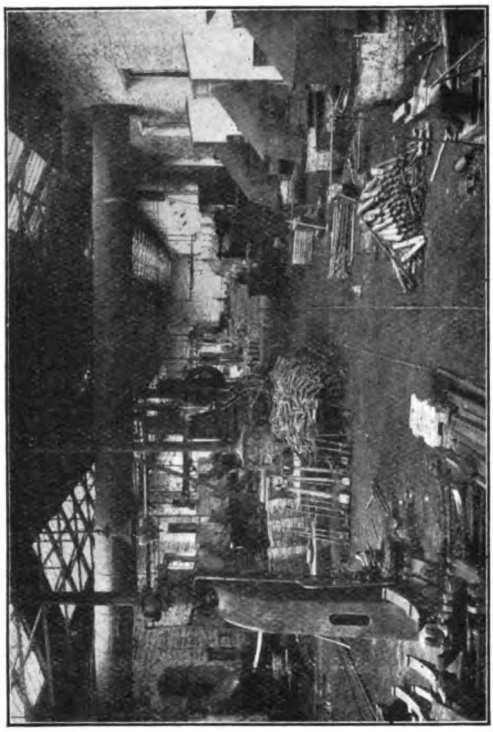
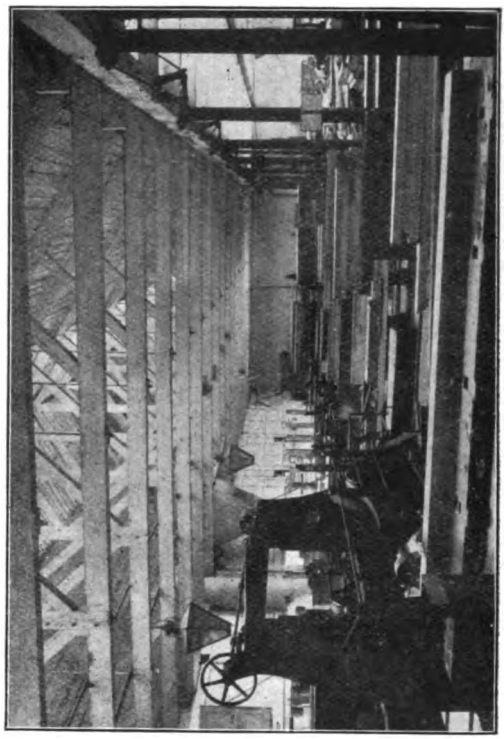
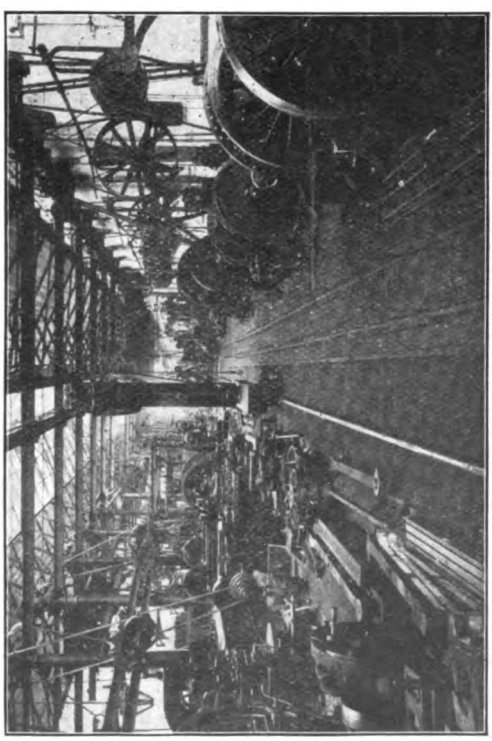


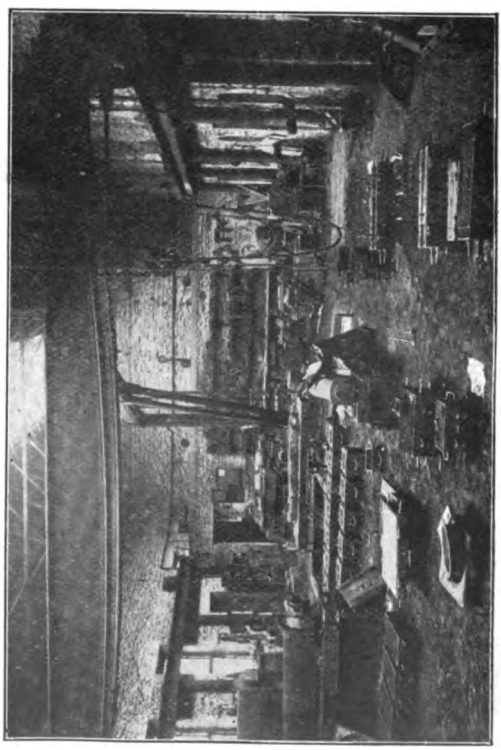
LOCOMOTIVE SMITHY.



SAW MILL.



MACHINE SHOP.



IRON FOUNDRY.

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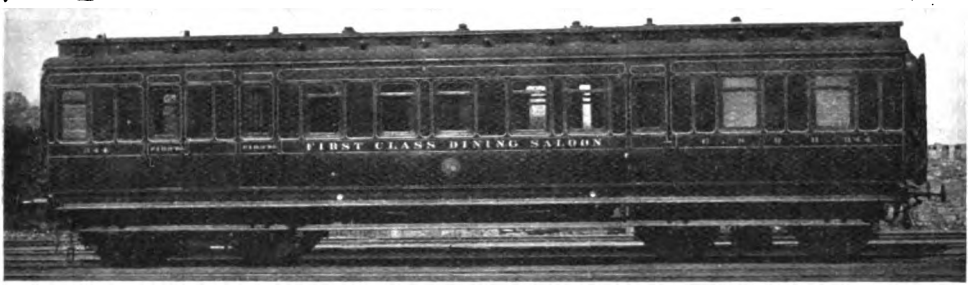
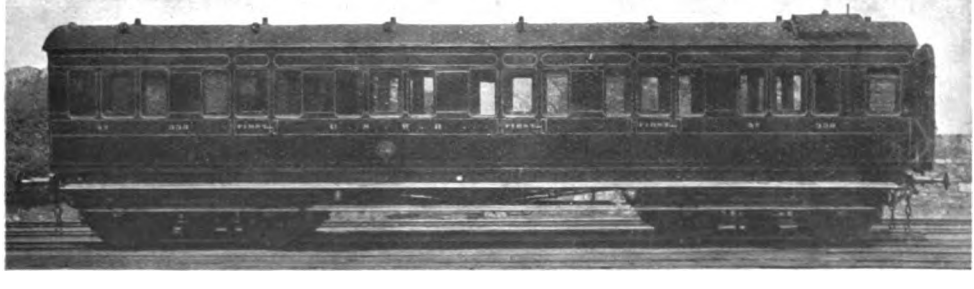


FIRST-CLASS DINING SALOON.

is a Bradley hammer, served by an oil furnace adjacent. To comply with regulations the main oil reservoir is away from the building, a small reservoir near the furnace being refilled as required by means of a small pump. The gas producers for the Siemens furnace in the smithy are located in the yard fronting the block of buildings so far mentioned, and, as will be gathered from one of the photographs reproduced, the large overhead gas pipe constitutes a leading feature in the general view. The case-hardening shop is placed alongside the gas producers.

The yard enclosed by the fitting, erecting and boiler shops and the smithy and forge is partly used for general purposes, but it also provides access to several smaller departments. The testing shop is under the direction of Mr. MacNamara. This gentleman, as chemist and photographer, has a small laboratory, while for testing materials he has a Buckton 50-ton testing machine and various appliances. In this shop are also placed a Walschaert valve gear model, and a Stephenson link motion model. Entering the testing shop attention is directed to a well-made model—of the steam engine which drives the sawmill—made by Mr. MacNamara about 30 years ago. A hand operated air pump adjacent enables this engine to be worked. As a model-maker Mr. MacNamara has a certain reputation, and a model of an old 2–4–0 locomotive, built by him many years ago, is in the hall of the Institution of Mechanical Engineers in London. Between the testing and the erecting shops is the coppersmiths' department, with usual accommodation.

Returning towards the main entrance the iron foundry may be visited. This is 101 ft. long and 45 ft. wide, fitted with a six-ton overhead crane. A division is devoted to machine moulding, but as a rule ordinary methods are practiced. The heaviest castings made are engine cylinders (cast in pairs together), turntable centres and the like. There are two 30 cwt. cupolas, with an electrically-driven Roots' blower in a shed adjoining for supplying the blast. Work is done in this shop for the signal and engineering departments as well as for rolling stock. A portion of this building constitutes the brass foundry. The remaining buildings in this group belong to the stores department serving the whole of the system, and not merely the works. The pattern shop is in a small isolated building. An electric motor drives a few tools, of usual types, and the pattern store is above. In this building is a model of an engine cab and firebox built up



FIRST-CLASS VESTIBULED BRAKE CARRIAGE.

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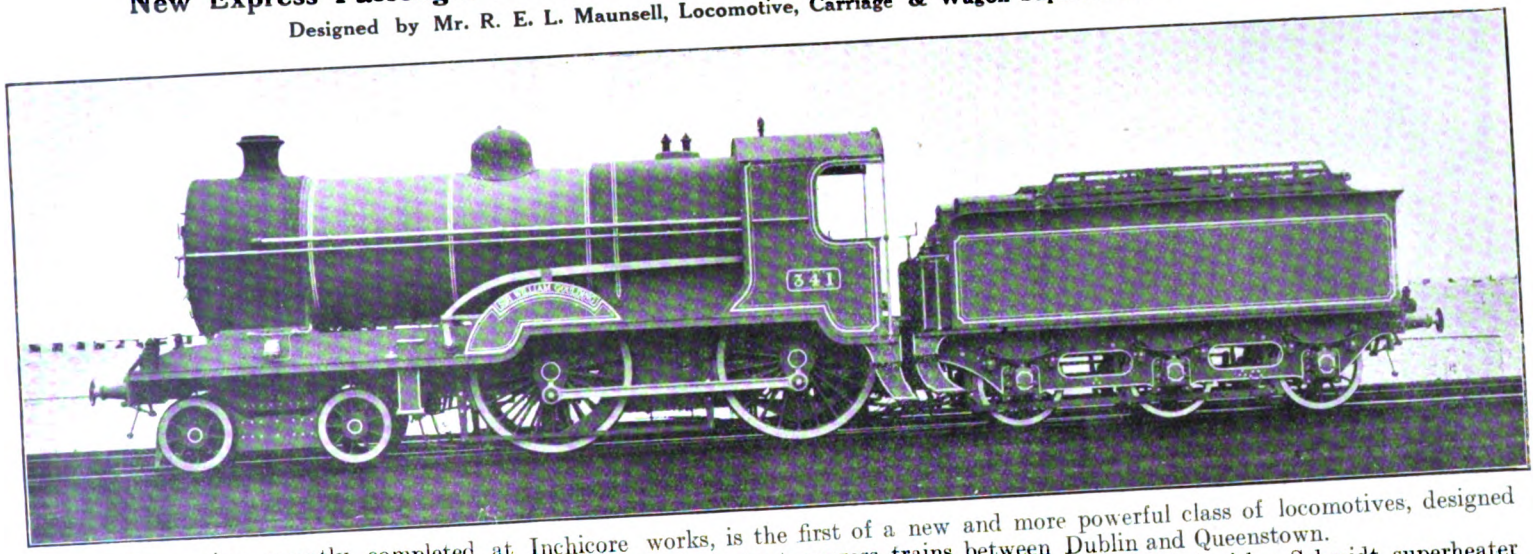
New Express Passenger Locomotive: Great Southern and Western Railway, Ireland.

Designed by Mr. R. E. L. Maunsell, Locomotive, Carriage & Wagon Superintendent.



This engine, recently completed at Inchicore works, is the first of a new and more powerful class of locomotives, designed by Mr. R. E. L. Maunsell, M.Inst.M.E., for working the important express trains between Dublin and Queenstown.

The firebox is of the Belpaire type. The boiler, which is 5 ft. 3⅜ in. diameter inside, is provided with a Schmidt superheater of 24 elements, and the safety valves are arranged for a working pressure of 160 lb. per sq. in. This, however, may be increased, if required, to 175 lb. There are two 2½ in. diameter pop safety valves placed on top of the firebox casing. A steam jet draught retarder is fitted in the smokebox to prevent overheating of the superheater elements when steam is shut off. Steam distribution is effected by inside admission piston valves actuated by Walschaert gear.

Reversing is affected by a screw and locking handle of the usual type. Owing to the large diameter of the boiler, it was found impracticable to connect the reversing rod directly to the reversing shaft. The latter is actuated from a short supplementary shaft, a lever on the end of which is controlled from the footplate. The engine has been named *Sir William Goulding*, after the Chairman of the Great Southern and Western Railway Company.

Cylinders	20 in by 26 in.
Coupled Wheels	6 ft. 7 in.
Bogie Wheels	3 ft. 0 in.
Grate Area	24·8 sq. ft.

Heating Surface:—	
Tubes	1,364·9 sq. ft.
Firebox	155·7 sq. ft.
Superheater	335·2 sq. ft.
Total	1,855·8 sq. ft.

Weight of engine in working order:—59 tons 7 cwt.; with tender, 96 tons 13 cwt.

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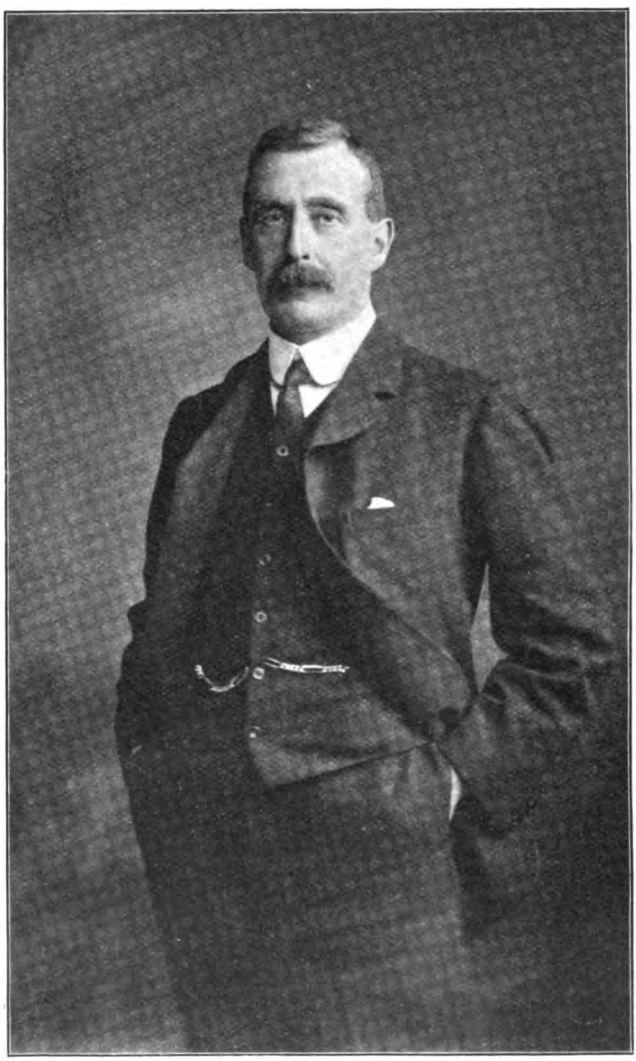
of wood. This applies to a 0–8–2 three-cylinder simple tank engine which Mr. Maunsell is constructing for use in the inclined shunting yard outside Kingsbridge station, and was made in order to ascertain whether the look-out for the engineman would be satisfactory and to settle certain details of design and equipment.

In the ground adjacent are the sheer legs for breaking up castings. The workshops and enclosed yard belonging to the permanent way department are also close by. The latter is chiefly used for the storage of rails, built up points and crossings, signal erection and so on, as well as for general iron and timber storage associated with the engineer's department. A range of corrugated iron buildings constitutes the shops, one portion being devoted to signalling work, and the other to machining and building up points. A Crossley gas engine in an outbuilding supplies power. In the signal shop are various machines and tools, hacksaws, drills and lathes. The permanent way shop has planers, slotters and drills as required. There is also a small smithy, with a Massey pneumatic hammer served by an air pump driven off the shop shafting, a timber drying shed, small sawmill and tinsmiths' shop. Before going further afield, it will be advisable to refer to remaining buildings at the east end of the works. North of the iron foundry and stores buildings is the paint shop, 182 ft. long and 176 ft. wide with 9 roads. Here engines and carriages are painted, the usual equipment of paint mixing appliances, paint stores, and washing accommodation being included. A traverser outside is used for moving vehicles in and out of the shop. Near by are the permanent way department offices. The engine shed alongside the locomotive offices and the fitting shop is shortly to be converted into a carriage shed, but at present it is, we should imagine, the most remarkable shed to be found anywhere. Inside it has seven roads, and will accommodate 50 engines, assuming a usual proportion of tender and tank designs. On the occasion of my visit, it contained examples of virtually all modern and several older classes of Great Southern and Western engines, including Mr. Coey's various 4–4–0, 2–6–0 and 4–6–0 engines, and Mr. Maunsell's first design, No. 341, *Sir William Goulding* (named after the present Chairman of the Company), a 4–4–0, fitted with Schmidt superheater, inside Walschaert valve gear



MR. R. E. L. MAUNSELL, M.A., M.INST.M.E.,
Locomotive, Carriage and Wagon Superintendent,
Great Southern and Western Railway.

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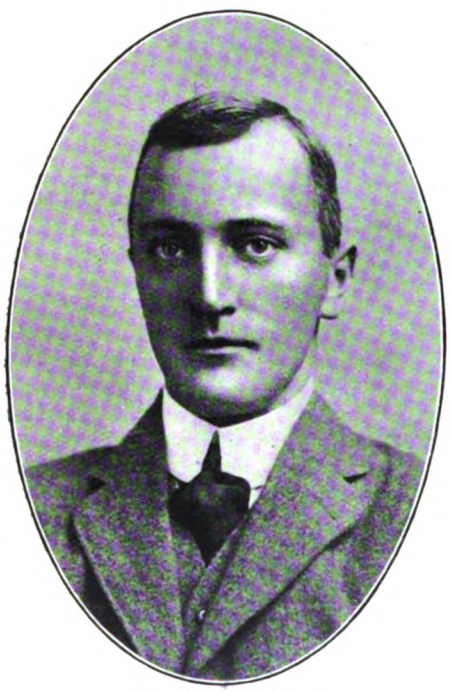
and other special features. I also noted two of the combined engines and saloons used by the Company's Paymaster for payment of the staff at out stations.

It is, however, the outside of the building which gives this engine shed its peculiar character. Briefly, if one views the shed so that its actual use is not indicated by surroundings, it would easily pass for an old ecclesiastical or scholastic building of grey stone, with its Gothic architecture, diamond-paned windows and tower. The latter is said to have been built for a lookout "signalman," whose duty it was in early days to observe the movements of trains coming up the severe bank from Kingsbridge, and to control traffic accordingly.



MR. E. A. WATSON,
Works Manager.

MR. ERNEST E. JOYNT,
Chief Draughtsman.

Proceeding now to the extensive area beyond the shops and divisions so far alluded to, the first building to be noted is the wagon shop, which is to become the engine shed, its own purpose being served by new buildings. The shop includes the usual assortment of machinery, but in view of its approaching dismantlement hardly calls for description in detail. A smithy is attached for general iron work. Next comes a remarkable coal stage, erected by Mr. Alexander McDonnell, when locomotive superintendent of the Great Southern and Western Railway. Tipping wagons of 10-ton capacity are used for locomotive coal, and these are run on to a high level staging and there tipped, the coal being transferred to the tenders by means of steam cranes. In line, and adjoining the erecting shop, are the general millwrights' and brass-finishers' and tinsmiths' shops.

Alongside the coal gantry is a timber yard, with overhead crane gantry and timber sheds. One of the buildings here is being converted into a large central power house to supply existing shops, and more particularly the new carriage and wagon shops which will be referred to shortly. Here are being installed as a nucleus of the plant, two 300 B.H.P. Diesel engines, built by Sulzer Brothers, of Winterthur, Switzerland, with dynamos, but the power house will be large enough for considerable extension. Electrical requirements are at present supplied from a small power house, containing a high-speed engine (by W. Sissons & Co., of Gloucester) driving a dynamo, steam being generated in a locomotive boiler fired with sawmill waste. Near by are the pumps for the hydraulic

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accumulators supplying power to the boiler shop, as also an Ingersoll-Sargent air-compressor for the pneumatic tools.

The sawmill which is well designed and well lighted, has the usual equipment of machinery—circular and band saws, log saws, multiple plank saws, grooving and boring machines for sleepers, and moulding machines. An old vertical engine supplies power, this being a reconstruction of the original engine of which a model is placed in the testing shop, but now converted into a double tandem compound by the addition of high pressure cylinders to each of the two original cylinders which serve as

MR. H. W. CROSTHWAIT,
Running Superintendent.

low pressure. The sawmill is fitted with underground conduits for sawdust and shavings drawn from the various machines by exhaustion. The carpenters' shop and the grindery do not call for special reference, and it will be sufficient to mention the gas works, oil gas works and creosoting works which are passed as one proceeds to the new carriage and wagon shops at the far end of the works area. These are now virtually completed, as will be seen from the photograph reproduced, but a good deal has to be done as regards interior equipment before all the work can be transferred there.

The carriage erecting shop is 232 ft. long and 203 ft. wide, in four bays formed by pillars supporting the roof. Two of the bays have four roads, and will be used for vehicles under repair. The third bay will contain woodworking machinery, some of it transferred from the old carriage and wagon shop, others newly purchased. Among these tools may be specially mentioned :— A 6 ft. by 3 in. double spindle moulding machine, 42 in. band saw, hand feed planing and thicknessing machine, 10 in. by 6 in. tenoning machine ; these are being supplied by Messrs. Haigh & Gruban. There will also be a new Robinson's horizontal hollow chisel morticer, as well as a vertical morticing and boring machine previously supplied by the same makers, a swing cross-cut saw and a tenoning machine for wagon solebars. The end bay is for erecting new carriages and wagons.

At the end of this building there will be a 64 ft. electrically operated carriage traverser by Heywood & Co., communicating with a still larger building containing five bays. The length of the first division which will form the lifting shop, is 320 ft. by 53 ft. wide. It is being provided with two overhead 15-ton electric cranes, by Craven Bros., by means of which the carriage bodies with their underframes will be lifted from off the bogies, and placed on stands in the space adjoining the entrance road. The next section, which, with the remainder of the building is 185 ft. long, in bays of 50 ft. span, is to be devoted to brake repairs and general fitting work. Adjoining are the bogie and underframe shops, in both of which there is installed a 5-ton overhead travelling electric crane, by Vaughan & Co., of Manchester. These shops will be provided with the following machines :—48 in. carriage wheel lathe, by Niles-Bement-Pond ; a wheel-balancing machine and a straightening machine, by Craven Bros. ; two 6 in. Asquith drilling machines ; a tyre stud drilling machine, by Fairbairn Kennedy ; three wheel lathes, by Hetherington ; journal re-turning lathe, by Craven ; axle lathe ; wheel centre boring lathe, double axle centreing lathe, and hydraulic wheel press, by Hetherington ; two portable hydraulic rivetters, by H. Berry ; notching machine, by H. Pels.

A smithy, equipped with Buckton spring testing machine, two spring plate machines, by Craven Bros. ; a 10 cwt. Massey pneumatic hammer, a 500 lb. Bradley hammer, a shearing, punching and bar cropping

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machine, by H. Pels, and two spring furnaces, completes this building. Near by is a stores building serving these shops. When the extensions are in full working order the conversion of the carriage and wagon shop into the engine shed and of the engine shed into a carriage shed will take place, and the transfer of some of the existing machinery and departments to new premises will overcome present difficulties as regards equipment and accommodation.

It is not here necessary to deal in detail with the locomotives and rolling stock of the Great Southern and Western Railway, but I am able to include views of a representative selection of examples of modern practice. As regards passenger rolling stock, I may mention that many of the vehicles will compare favourably with some of the best coaches used in England and Scottish railways. Mr. Maunsell is also taking advantage of the freedom offered by the wide Irish gauge by constructing vehicles up to 9 ft. 10 in. wide.

Mr. R. E. L. Maunsell, M.A., M.Inst.M.E., Locomotive Carriage and Wagon Superintendent of the Great Southern and Western Railway, began his engineering training at Inchicore, as an apprentice under Mr. Ivatt. After spending several years there, he joined the Lancashire and Yorkshire Railway, serving first in the works and drawing office at Horwich, and later occupying the post of locomotive foreman in charge of the Blackpool and Fleetwood district. In 1894 he went to India, as Assistant Locomotive Superintendent of the East Indian Railway, being subsequently appointed District Locomotive Superintendent of the Asansol district. Two years later he returned to Inchicore as Works Manager under Mr. Robert Coey, until, on the resignation of Mr. Coey, through ill-health, Mr. Maunsell was appointed to the position of Locomotive Superintendent in June, 1911.

Photo] [*F. E. Mackay.*

MIDLAND RAILWAY (LONDON, TILBURY AND SOUTHEND SECTION):
Ealing–Southend through train, drawn by new 4–6–4 (Schmidt superheater) tank engine No. 2103.

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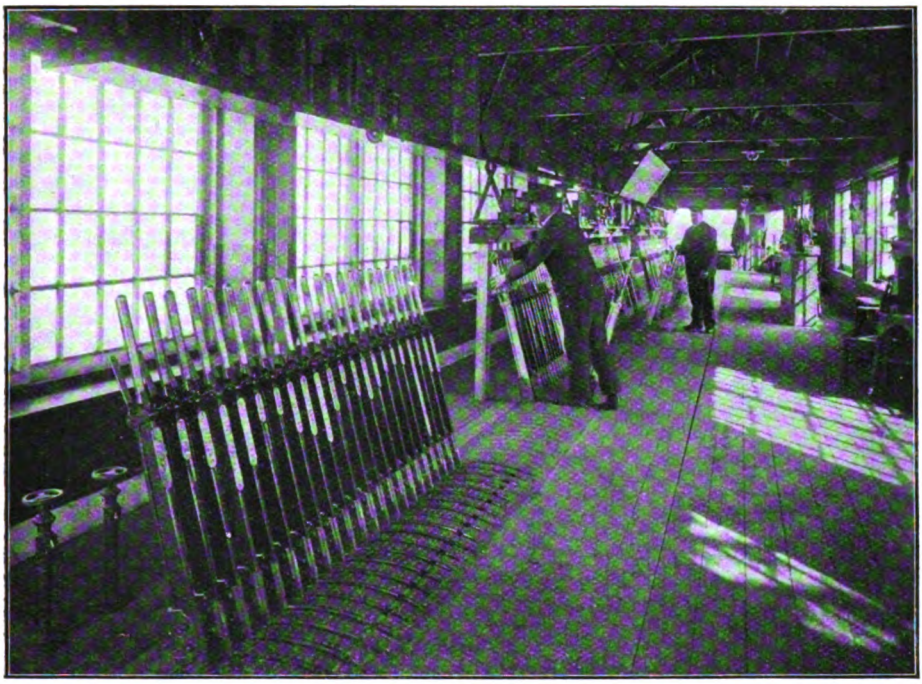

NEW SIGNAL FRAME, READING MAIN LINE WEST SIGNAL CABIN.

Reading as a Railway Centre.

By H. M. ALDERMAN.

MOST people associate the town of Reading with biscuits and seeds, but while undoubtedly the world-renowned firms of Huntley & Palmer and Sutton & Sons have in a large measure made Reading a prosperous industrial town, it is equally true that the enormous trade of these two great firms was built up through and is dependent upon the exceptional railway facilities which give to the Berkshire county town quick and easy communication virtually to all parts of the United Kingdom. Reading is, in addition, fortunate in its position as regards waterways. These are outside the scope of this article, and here it is sufficient to say that the Thames and the Kennet open up to Reading nearly all the navigable canals of the West and Midlands, the Great Western Railway Company being, it may be mentioned, the owners of the Kennet and Avon Canal.

Readers of the RAILWAY MAGAZINE scarcely need reminding that Reading is served by three railway companies, the Great Western Railway, South Eastern and Chatham Railway, and the London and South Western Railway, although it is, of course, the Great Western Railway that gives to the town its pre-eminence in the South. Situate on the main line, it is, from a railway point of view, one of the busiest provincial centres on the whole of the huge progressive Great Western system. Here, 36 miles from Paddington, is the first stop for many secondary and a few principal Great Western express trains, and here diverge the important trunk routes :—

(A.) The old main line to the West of England by way of Didcot, Swindon, Bath and Bristol to Taunton, Exeter, Plymouth, Devonport, Truro and Penzance ; also to Barnstaple, Ilfracombe, North Devon, and to Cornwall and Devon generally.

(B.) The newer shortened route to the West of England *viâ* Westbury and Castle Cary into Taunton—the direct route, and considered by enginemen as the finest road bed in the country, over which travels " The Cornish Riviera Limited " and many other important expresses.

(C.) From Reading also over the same route as B, as far as Castle Cary, for Yeovil, Dorchester and Weymouth.

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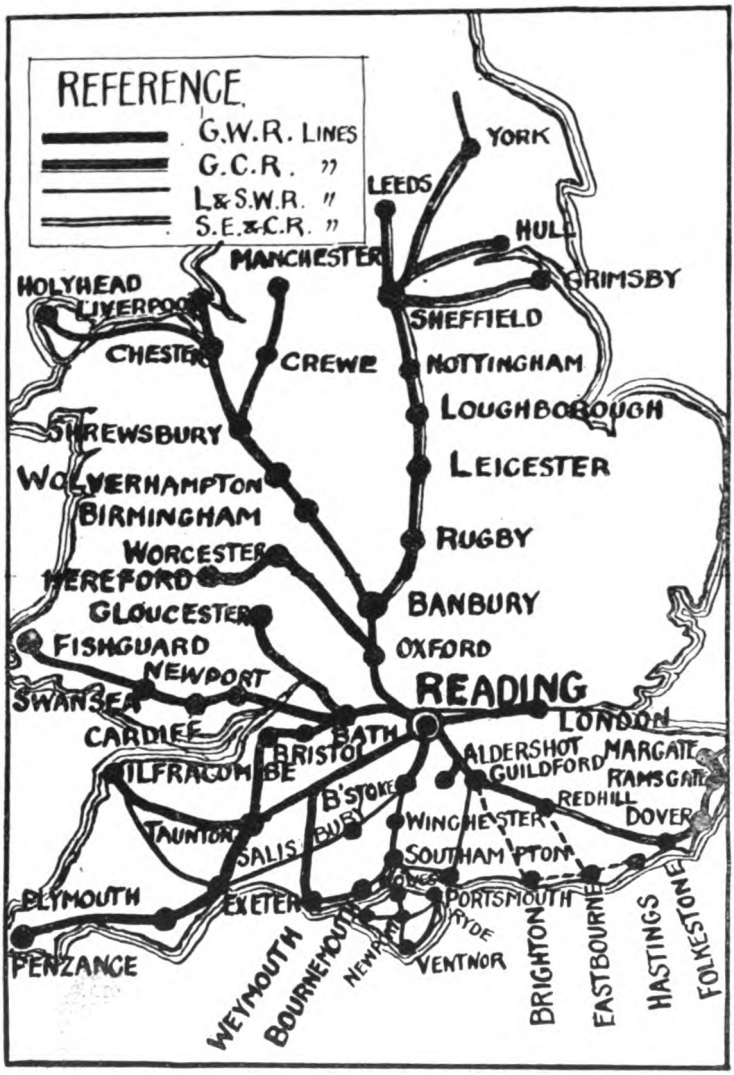

SKETCH MAP SHOWING RAILWAY ROUTES CENTREING UPON READING.

(D.) There is also the new route to Ireland (Rosslare, Waterford and Cork) *viâ* Fishguard ; the same route as A. from Reading to Swindon, and thence through Badminton, the Severn Tunnel, Newport, Cardiff, Swansea, with alternate routes, *viâ* Bristol and the Severn Tunnel, or by way of Stroud, Gloucester, Chepstow and Newport, serving nearly the whole of the south and west of Wales.

(E.) The old main line to Birmingham, Wolverhampton, Shrewsbury, Chester, Birkenhead, Liverpool, Holyhead, Crewe, Manchester, by way of Didcot, Oxford and Banbury, at the latter place joining with the Great Central Railway ; a line giving from Oxford access to Cheltenham, Worcester, Hereford and other towns.

(F.) A short branch from Reading to Basingstoke connects with the London and South Western main line trains for places in Somerset, Dorset, Devon and Cornwall ; also to Winchester, Southampton, Portsmouth, the Isle of Wight, the Channel Islands, Bournemouth, Poole, Swanage and Weymouth.

(G.) The South Eastern and Chatham Reading line gives direct communication with Aldershot, Guildford, Redhill, Tonbridge, Ashford, Folkestone, Dover and the Continent, Deal, Ramsgate and Margate, with connections to Maidstone, Tunbridge Wells, Bexhill, St. Leonards, Hastings, Canterbury, and other Kentish towns and seaside resorts. From Redhill the South Eastern and Chatham line proceeds through Croydon to Charing Cross. Both at Guildford and at Redhill connection is made with the London, Brighton and South Coast Railway for Horsham, Worthing, Brighton, Lewes, Newhaven, Eastbourne, Hastings and St. Leonards. South Eastern trains use the same station at Guildford as the London and South Western Railway ; thus easy connection is afforded with the trains of the latter company for Portsmouth, Southsea, Gosport, the Isle of Wight, Hayling Island, and Chichester, the last two named *viâ* Havant. The London and South Western direct route to Reading from Waterloo is through Richmond, Staines, Ascot into Wokingham, thence over the metals of the South Eastern and Chatham Railway for the remaining seven miles into Reading.

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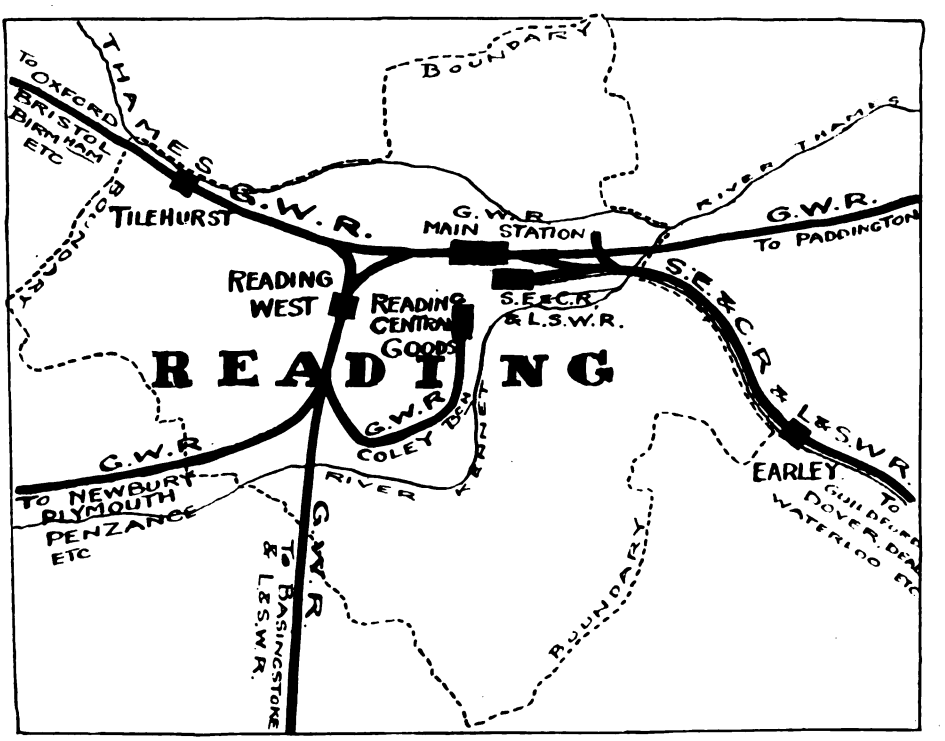
Of present-day travel the outstanding feature is "through communication," enabling the travelling public to pass over the lines of several companies between places as far apart as Birkenhead and Dover without change of carriage and in up-to-date express trains, and a glance at the accompanying sketch map illustrates the important position which Reading occupies in the working of these through services. The through services that affect Reading are three. The earliest in operation was that from Birkenhead to Dover and Deal. Leaving Birkenhead at 9.5 a.m., the timings for intermediate towns are: Chester, 9.42 a.m.; Shrewsbury, 11 a.m.; Wolverhampton, 11.48 a.m.; Birmingham, 12.15 p.m.; Warwick, 12.20 p.m.; Leamington, 12.50 p.m.; Banbury, 1.19 p.m. (passengers from the Great Central line join the train at Banbury); Oxford, 1.54 p.m.; Reading (arrive) 2.25 p.m., depart (Great Western station) 2.50 p.m.; Guildford, 3.33 p.m.; Folkestone, 5.32 p.m.; Dover, 5.44 p.m.; Walmer, 6.4 p.m.; Deal, 6.10 p.m.—a distance of 305½ miles in 9 hrs. 5 min. In the opposite direction, the train leaves Deal 10.38 a.m., Walmer 10.43 a.m., Dover 11.5 a.m., Folkestone (Central) 11.25 a.m., Guildford 1.47 p.m., Reading (arrive) 2.37 p.m. (depart) 3 p.m., Oxford (arrive) 3.38 p.m., Banbury 4.34 p.m. (passengers for the Great Central Railway change here), Leamington 5 p.m., Warwick 5.10 p.m., Birmingham 5.45 p.m., Wolverhampton 6.10 p.m., Shrewsbury 7.19 p.m., Chester 8.30 p.m., Birkenhead 9.15 p.m., connecting with the ferry thence to Liverpool—305½ miles in 10 hrs. 37 min.

The second of these through services is remarkable for the fact that the train in question — luncheon corridor express, Bournemouth Central to Newcastle-on-Tyne —passes over the lines of four railway companies—from Bournemouth to Basingstoke, over the London and South Western Railway; from Basingstoke to Banbury, over the Great Western; thence to York by Great Central; finishing the journey over North Eastern. This train does not in either direction run into the main line station at Reading, but stops at Reading West. The times are as follows:—Bournemouth (Central) depart 11.31 a.m., Southampton (West) 12.23 p.m., Winchester 12.51 p.m., Basingstoke 1.25 p.m., Reading 1.48 p.m., Oxford 2.52 p.m., Banbury 3.26 p.m., Rugby 4.5 p.m., Leicester 4.28 p.m., Nottingham 5.3 p.m., Sheffield (Victoria) 5.56 p.m., York



RAILWAYS AND STATIONS AT READING.

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7.37 p.m., Newcastle 10.48 p.m. In the opposite direction the train leaves Newcastle at 8 a.m., York 10.23 a.m., Sheffield 11.21 a.m., Nottingham 12.27 p.m., Leicester 1.1 p.m., Rugby 1.26 p.m., Banbury 1.57 p.m., Oxford 2.45 p.m., Reading West 3.23 p.m., Basingstoke 4 p.m., Winchester 4.25 p.m., Southampton (West) 4.50 p.m., and Bournemouth (Central) 5.54 p.m.

The remaining through train — the Bournemouth to Birkenhead luncheon car train—does not in either direction stop at Reading, nor connect with other trains for the town, and is mentioned here simply to illustrate the inter-working which now exists between the London and South Western and the Great Western Companies. Composed of luxurious London and South Western rolling stock, this train is hauled over the Great Western track from Basingstoke to Oxford by a London and South Western Engine, which makes the return run on the train from Birkenhead to Bournemouth.

Next in importance to through trains and of the same description are "through carriages" to places other than those served by the "through" expresses. During the summer months there are on week days from the Great Western main station through carriages to

	Services		Services
Aberystwyth ..	2	Barmouth	1
Cheltenham	3	Chippenham ..	7
Eastleigh	3	Minehead	1
Paignton, Torquay ..	3	Portsmouth ..	3
Southampton (Docks)	3	Stokes Bay ..	1
Weston-super-Mare ..	3	Weymouth ..	5
Winchester	5		
And to Reading from			
Cheltenham ..	1	Crewe	1
Exeter (St. Davids) ..	6	Fareham	3
Manchester (London Road)	1	Penzance	2
Plymouth (Millbay)	2	Portsmouth ..	2
,, (North Rd.)	3	Ross	1
Southampton ..	1	And 1 on Saturdays only	
Stockport	1	Stokes Bay ..	1
Taunton	6	Weston-super-Mare	5
Winchester (G.W.) ..	1	Winchester (L.&S.W.)	2
Yeovil (Pen Mill) ..	4		

In winter these arrangements are necessarily somewhat curtailed and altered.

From the South Eastern and Chatham station in summer special fast trains at excursion fares leave for Tunbridge Wells, Hastings, Canterbury, Folkestone, Dover, Deal, Walmer, Margate and Ramsgate. These trains are very popular, and bring the Kentish coast resorts conveniently near to the Midlands *viâ* Reading. Nowadays, distances—especially so in railway travelling—are reckoned in hours, that is, the time taken in getting from one place to another. To look at Reading from this point of view is readily to understand why it has become so largely both a residential and a business centre. A glance at the sketch map on page 280 shows Reading's exceptionally good position for easy and quick communication with the great towns, and mention may be made of the fact in passing, that over 200 commercial travellers who live within the Borough have chosen the town as being ideal from the "Bradshaw" point of view.

The following table summarising the train services between Reading and a few of the chief towns gives some idea of the excellence of the train services which link up the town with other populous centres of the country:

	Miles.	Trains to daily.	Trains from daily.	Quickest Booked time.
				H. M.
Paddington	36	45	35	0 41
Bristol	81½	14	15	1 25
Plymouth	193	9	9	4 18
Birmingham	93½	9	10	2 5
Cardiff	117	15	15	2 5
Oxford	27½	22	21	0 32
Southampton ..	46	11	11	1 24
Weymouth	116	8	4	2 51
Leicester	95	10	9	2 20
Sheffield	153½	6	7	3 42
Newcastle-on-Tyne ..	283	6	5	7 23
Dover	113	7	7	2 59

Local trains by Great Western Railway are available to Basingstoke, Newbury, Lambourn, Hungerford, Didcot, Wallingford, Abingdon, Henley, Maidenhead, Marlow, High Wycombe, Slough and Windsor; by South Eastern and Chatham Railway, to Wokingham, Wellington College, Blackwater and Camberley, Aldershot, Guildford, Dorking, Reigate and Redhill; and by London and South Western Railway to Wokingham, Ascot, Virginia Water, Chertsey, Weybridge, Staines and Windsor. There is much to justify the assertion made in a local guide that "next to London, Reading is the most important railway centre of the South." Enjoying as it does a well-favoured position in the heart of some of the most beautiful and healthy parts of Berks, Hampshire, Oxfordshire and Bucks, it is not to be wondered at that the town is much in favour residentially. A splendid system of electric tramways, owned and worked by the Corporation, bring all parts

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of the borough within easy reach of the railway stations.

A very useful and important feature of the train services maintained at Reading is the direct communication with the ports along the South and West coasts. With the opening of the Great Western route *viâ* Fishguard, Reading was placed in the forefront of English towns having a boat train service to Ireland, and it is worth noting that in the case of one of the down and the two up boat trains, Fishguard and Paddington, Reading is the only station stopped at between Newport and Paddington. The timings are as follow:—*Viâ* Rosslare: Reading (dept.) 9.28 a.m., Fishguard Harbour 2.15 p.m., Rosslare Harbour (arrive) 4.50, Waterford 6 p.m., Cork 8.50 p.m., Killarney 10.2 p.m., Dublin 10.20 p.m., connecting to all stations on the Great Southern and Western Railway and the Dublin and South Eastern Railway. For the night boat: Reading 8.56 p.m., Fishguard (arrive) 2.15 a.m., Wexford (arrive) 6.43 a.m., Waterford 6.25 a.m., Cork 9.20 a.m., Killarney 10.28 a.m., Dublin 10.30 a.m. (timings being different on Sunday mornings). From Ireland there is a day and night boat service—Dublin (depart) 6.55 p.m., Killarney 6.45 p.m., Cork 7.35 p.m., Waterford 10.35 p.m., Wexford 10.30 p.m., Fishguard Harbour (depart) 3.25 a.m., Reading (arrive) 8.21 a.m. For the day boat: Dublin (depart) 6.40 a.m., Cork 8.30 a.m., Killarney 7.28 a.m., Wexford 11.20 a.m., Waterford 11.25 a.m., Fishguard Harbour (depart), 4 p.m., Reading (arrive) 8.57 p.m.

An alternative steamer route is that to Waterford—Reading (depart) 5.15 p.m., Fishguard (arrive) 11.15, Waterford (arrive) 7.35 a.m., connecting to towns throughout the South of Ireland. In the opposite direction—Waterford (depart) 5 p.m., Fishguard (depart) 3.25 a.m., Reading (arrive) 8.21 a.m. The third steamer route is from Fishguard to Cork, every Tuesday, Thursday and Saturday, leaving Reading by the same train as connects with the Waterford boat—5.15 p.m., Fishguard (arrive) 11.15 p.m., Cork (arrive) about 9 a.m. From Ireland every Monday, Wednesday and Friday—Cork (depart) 7 p.m., Fishguard (depart) 6 a.m.; Tuesday, Thursday and Saturday mornings, Reading (arrive) 11.52 a.m. The Great Western Railway route to the North of Ireland is *viâ* Liverpool and Belfast. Connecting with the through train Dover to Birkenhead, previously described, a boat leaves Liverpool at 10 p.m., arriving in Belfast about 6 o'clock the following morning. The service from Ireland by this route is—Belfast (depart) 9.15 p.m., Liverpool (arrive) 6.30 a.m., Birkenhead (depart) 8.5 a.m., Reading (arrive) 1.32 p.m.; on Sundays 4.55 p.m. at Reading. Time given for Irish towns is Irish time—25 minutes behind Greenwich. Two other boat train services which serve Reading *en route* are those to the Channel Islands by Great Western Railway *viâ* Weymouth—Reading (depart) 10.10 p.m., arriving at Guernsey about 6.30 a.m.; to Reading from Guernsey on the same days (depart) 10.15 a.m., arriving at 6.40 p.m. The other route is by way of Basingstoke and the London and South Western Railway to Southampton—Reading (depart) 10.13 p.m., Guernsey (arrive) about 6.45 a.m.; from Guernsey 10 a.m., Reading (arrive) 7.15 p.m. These times are in force up to the end of September only. During the winter months the services are different.

A VIEW IN MESSRS. HUNTLEY AND PALMER'S SIDINGS.

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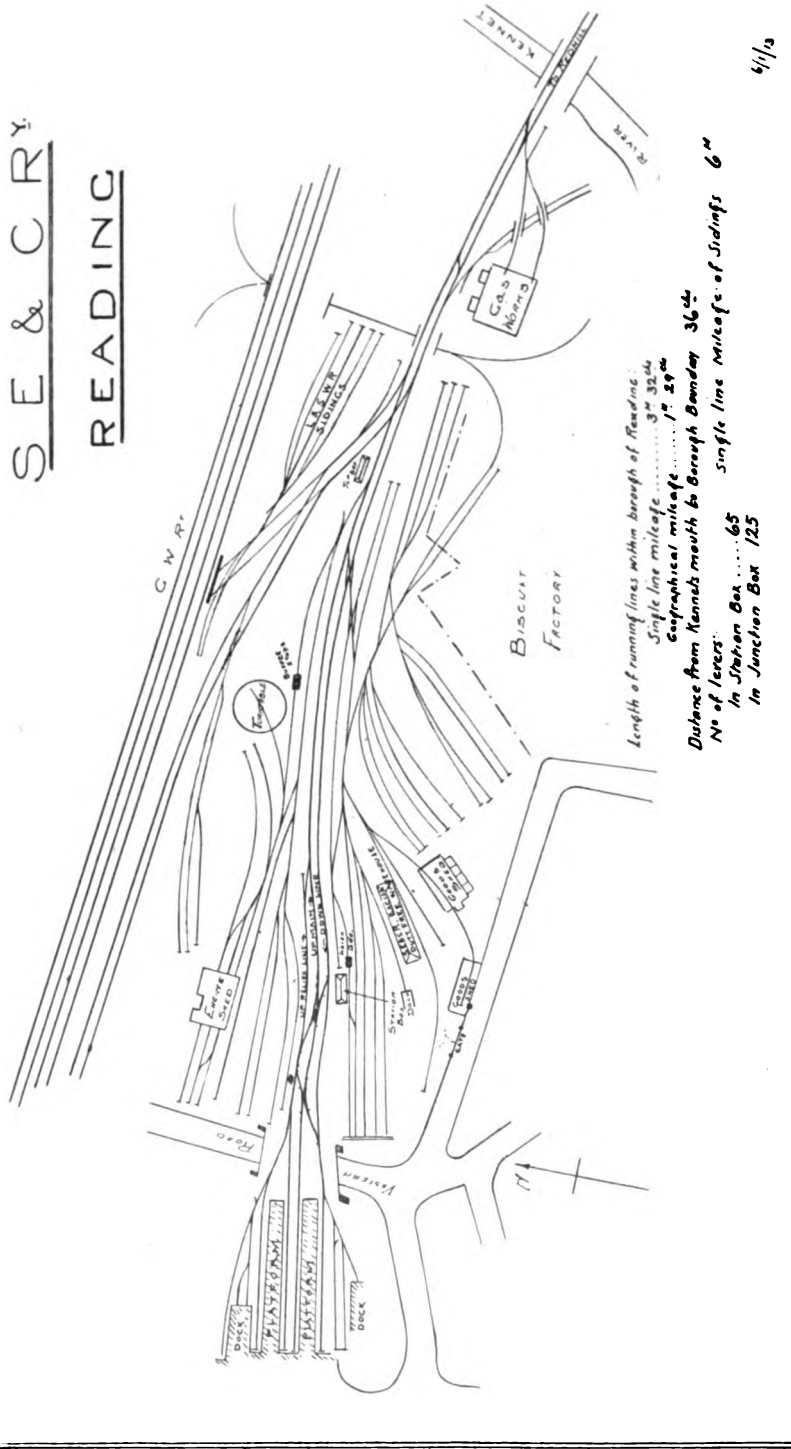
S E & C R Y.
READING
G W R
Biscuit Factory
Length of running lines within borough of Reading:
Single line mileage 3m 32ch
Geographical mileage 1m 29m
Distance from Kennets mouth to Borough Boundary 36ch
No of levers:
In Station Box 65
In Junction Box 125
Single line Mileage of Sidings 6m
4/1/13

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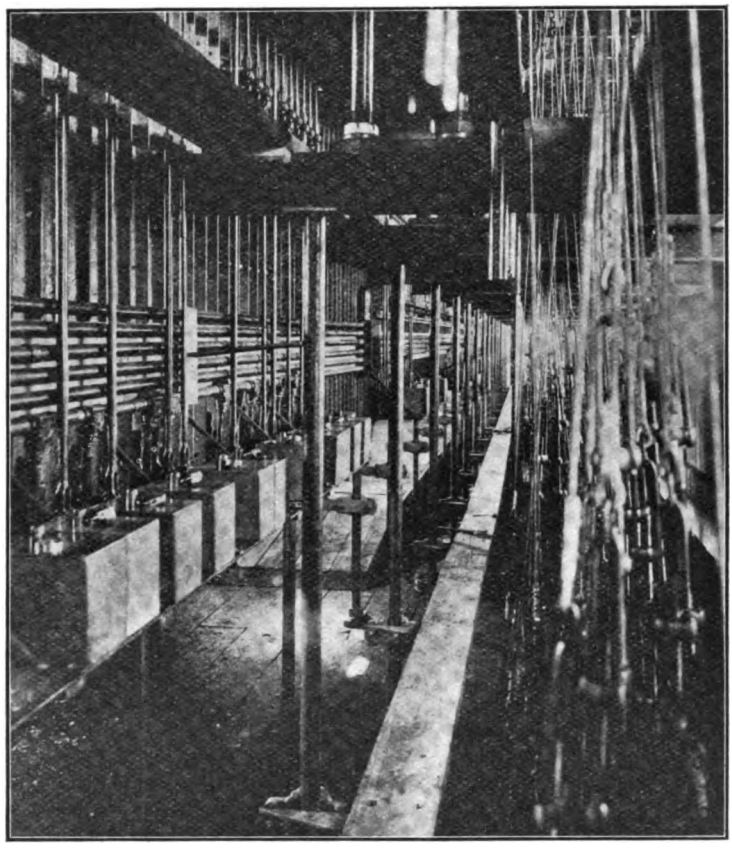

READING MAIN LINE WEST BOX, GREAT WESTERN RAILWAY : Underside of new locking frame.

From Reading to Folkestone and Dover the best service by the South Eastern and Chatham Railway has been partially dealt with under the heading of through services — the through train from the Great Western and Great Central lines leaving Reading at 2.50 and due at Dover at 5.44 p.m. A train leaving Reading (South Eastern and Chatham Railway) at 4.23 p.m. is due in Dover at 9.36 p.m., connecting with the turbine steamer leaving Dover Pier at 11.5 p.m., Paris being reached next morning at 5.40. In the opposite direction the timings are: Brussels (depart) 10.3 p.m., Paris 9.20 p.m., Dover Pier (arrive) 3.30 a.m., Town station (depart) 6.30 a.m., Reading (arrive) 10.48 a.m.; or by the through train to Great Western and Great Central lines from Dover 11.5, Reading (arrive) 2.37. Another great highway to the Continent available from Reading is the London and South Western route *viâ* Southampton and Havre by the up-to-date turbine steamers of that company—leaving Reading at 10.13 p.m. and arriving Southampton Docks *viâ* Basingstoke at 12.7 midnight; steamer (depart) 12.30, Havre (arrive) 7 a.m., Paris 11.22 a.m.; in the reverse direction—Paris (depart) 7.48 p.m., Havre 12 midnight, Southampton (depart) 7.45 a.m., Reading (arrive) 9.41 a.m. or on Sunday morning 10.42.

Much could be written of Reading as a boating centre, but reference to a map of the river Thames will explain its attractions in this respect better than any description. Reading is a most convenient centre for both the upper and lower reaches of the Thames, and especially so for London people by reason of the quick service from Town. From May to September the Great Western and South Eastern and Chatham Companys issue Thames Valley circular tour tickets for combined rail and river trips in connection with Messrs. Salter Brothers' Oxford and Kingston steamers. There are many boat proprietors along the Thames and Kennet at Reading, from whom boats of every description may be hired. During the season Messrs. Cawston, East & Co., etc., have steamers making daily trips to other riverside places. Henley Regatta means an enormous amount of traffic at the Reading stations.

Followers of Izaak Walton obtain plenty of good sport around Reading in both the Thames and the Kennet. At Twyford the Loddon can be fished, while Hungerford, famous for its trout, is within easy distance by G.W.R. At the present day professional football is responsible for a vast excursion traffic on our railways, and the Berkshire county town has its share of the volume. The Reading Football Club, Ltd., the oldest in the Southern League and one of the most famous in the country, attracts thousands

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of enthusiasts from a wide radius to its matches, which are played at Elm Park, and especially heavy is the railway traffic in connection with the competition for the English Cup.

Reading witnesses a good deal of military traffic, this being the place of exchange for troop trains from and to Aldershot, Shorncliffe, Woolwich, etc, South Eastern and Chatham Railway with the Great Western Railway, for the various garrisons and depôts on their system. At Christmas the down main line departure platform at the Great Western station presents an animated appearance, with hundreds of soldiers making their way home for the Christmas furlough. The improved service which has been put into force between Reading and Wellington College during recent years, has enabled the people who have business in Reading to reside some few stations away. Another kind of traffic calling for notice are the race trains. Exceptionally heavy are the bookings to Newbury Race Course station. Many special trains are run from all parts of the Great Western system *viâ* Reading. It is interesting to notice another "through" train arrangement in connection with this race traffic. A London and South Western train from the Thames Valley lines of that company runs *viâ* the Great Western station at Reading direct to Newbury, hauled by a London and South Western engine for the entire run in each direction.

The greatest race meeting of the year—Royal Ascot—affects as far as Reading is concerned the London and South Western and the South Eastern and Chatham Railways. During these races the former company suspends the ordinary train service on their Reading line, running trains at suitable intervals to cope with the greatly increased traffic. On "Gold Cup" day the South Eastern and Chatham run a special service of trains between Reading, Earley, Wokingham, Bracknell and Ascot West.

Towns like Empires rise and fall. Many bustling towns which were centres for trade in the days of the stage-coach and the "flying waggon," but were left outside the track when our great trunk lines were planned or "linked up," have found their trade desert them, as the old order changed, until they finally arrived at that condition generally described as "sleepy old country towns." Berkshire provides a case in point, with a little variation, however, as to the cause. When the construction of the Great Western line to Birmingham and the Midlands was under consideration, it was intended to make Steventon (near Wantage) what Didcot is, to proceed to Abingdon and thence to Oxford. But the Abingdon people of that day objected successfully to the railway, and the line was made in its present direction, Abingdon having to seek communication with the Great Western some years later, by means of a privately owned line running to Radley—a distance of three miles; but during the past few years this short railway has been absorbed into the Great Western system. Had Abingdon been on the Great Western main line, one can readily believe that to-day it would have been equal to Reading in importance—or perhaps even greater; whereas it remains practically the same as it was 70 years ago. Reading (which, by the way, supplanted Abingdon as the capital of Berkshire) has forged ahead until it has become one of the largest provincial towns in the South of England, and gives every promise of being even greater. It is rich in history from Saxon times. It has the site of a famous abbey founded by Henry I. in 1121, part of the fabric of which, close to the railway stations, still remains. It was the scene of some of the fiercest fighting during the Civil War, and the temporary home of Parliament on several occasions. In 1700 the population was estimated at about 8,000, while in 1801 (at the first official census) it was 9,421. The figures for the last census were 75,214, but since then Reading has extended its municipal boundaries by the incorporation of Caversham, Oxon, and Tilehurst, so that the present population is estimated to be somewhere about 88,000.

The Great Western Railway was made through Reading in 1840, the station being opened for traffic on April 4, while the Reading, Guildford and Reigate Railway—afterwards absorbed by the South Eastern Railway—was made in 1848. Sutton & Sons was founded in 1806, and in 1841 Huntley & Palmer began business. These two industries have developed into huge concerns of world-wide repute, and together they employ between 7,000 and 8,000 workpeople. Other old-established works in the town are the tin manufactory of Messrs. Huntley, Borne & Stevens, several large breweries, chief among which are H. & G. Simonds, military contractors. Biscuit trains and beer trains are a feature of the goods traffic at Reading goods stations. In recent years the most important of new industries are those of Messrs. H. O. Serpell & Co., biscuit

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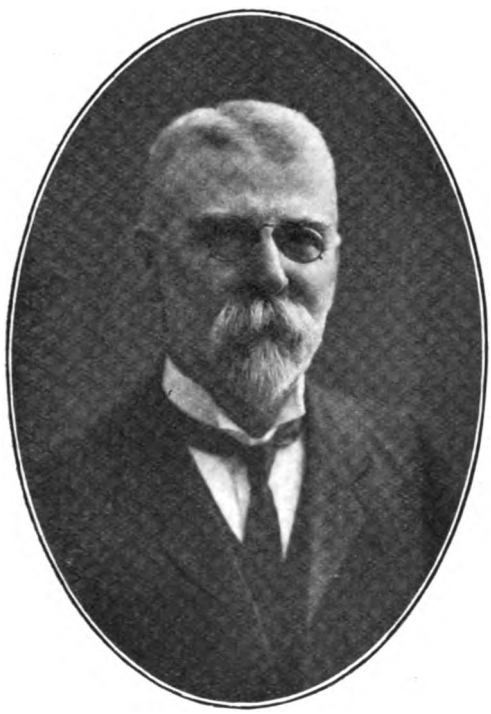
manufacturers, removed from Plymouth; the Pulsometer and Engineering Co., removed from London; Petty & Sons, printing works, and the extensive works of Messrs. Wyman & Sons, where is executed the bulk of the printing for the Great Western Railway. Other works include iron foundries, flour mills, sauce factory, joinery works, pottery, brick and tile works. The Wholesale Co-operative Society are building a large factory for jam and preserve making, on land adjoining the Coley Branch of the Great Western Railway. There are still available many excellent sites which are suitable for factories with both railway and canal frontage. Everything necessary to industry can be obtained at a reasonable figure—water, power (both gas and electricity). There is plenty of good housing accommodation of all classes to be had at reasonable rentals, and rates, despite the progressive government of the town, remain practically stationary. The Town Clerk or the Secretary of the Reading Chamber of Commerce will be pleased to answer any enquiries on this subject.



MR. J. H. NOBLE,
Stationmaster, Reading, Great Western Railway.

MR. EDWARD GRATWICK,
Station Superintendent, Reading, South Eastern and Chatham Railway.

I add a brief description of the stations and railways within the County Borough of Reading. The South Eastern and Chatham Railway line from near Earley station to the Kennet's mouth forms the boundary—a distance of about a mile and a half—and enters the borough proper at the bridge over the river Kennet, where, immediately to the left, are the sidings and works of the Gas Company, followed next by the huge works, covering 24 acres, of Messrs. Huntley & Palmer, into whose yard run the metals of both the South Eastern and Chatham and the Great Western Railways. The private sidings of this firm have a total length of over three miles, with about 50 switches and crossings, and, in fact, form a complete "goods yard." All their raw material, timber, coal, and returned empties are delivered direct into Messrs. Huntley and Palmer's works, and their manufactures, loaded ready for dispatch, are handed over to the three railway companies. An ordinary day's work on the sidings of these biscuit works comprises the unloading of over 100 incoming trucks and the despatch of approximately the same number of loaded wagons. Shunting operations are carried on by four

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locomotive tank engines of the four-wheeled coupled type—two 20-ton engines built by Messrs. Black, Hawthorn & Co., of Gateshead-on-Tyne, and the other two 25-ton engines by Messrs. Peckett & Sons, of Bristol.

We next come to the combined goods yard proper of the two companies—the South Eastern and Chatham and London and South Western Railways. Although each company has its own goods staff, the shunting arrangements are controlled by South Eastern and Chatham officials. To the right are the junctions with the Great Western Railway for the transfer of goods wagons, the locomotive sheds, and the passenger train junction with the Great Western Railway, enabling the through services to be made. The passenger station has no architectural pretentions. There are four platforms, roofed in for the greater part of the length. Both companies have their own booking and parcels offices, but the uniformed platform staff are entirely South Eastern and Chatham officials. Traffic is controlled by two signal boxes, " Junction Cabin " having 125 levers and the " Station Box " 65 levers.

The Great Western Railway line from Paddington enters the borough near the river Kennet bridge at the 35 mile-post, a hundred yards or so from the South Eastern and Chatham line. Immediately after crossing commence the goods marshalling sidings, followed by the first part of the goods yard, in which is situate the chief goods shed, with grain warehouse above, replete with every appliance, worked by hydraulic power for handling merchandise. In this shed takes place the interception of loads for transfer to the South Eastern and London and South Western goods yard. Hydraulic capstans are in position throughout the whole of the Great Western main goods yard for purposes of shunting. Passing over Vastern Road, with the power station immediately to the right, the line enters Reading main station—36 miles from Paddington. The present station was built in 1898-99, although the chief offices forming the frontage were erected between 30 and 40 years ago.

There are six platforms and six bays, massively built, and covered in with the usual Great Western type of roofing. No. 1, the down main, is 950 ft. long by 30 ft. wide. Here arrive and depart the express trains for the South-west, West, South Wales and Ireland, and the Midlands. On this platform are dining and refreshment rooms, chief booking office, the offices of the District Goods Manager and Stationmaster, telegraph office, luggage and cloak room, office for transfer of luggage to and from the South Eastern and Chatham and London and South Western station, inwards and outwards, parcels offices, chief bookstall, inspectors' office, and the usual waiting rooms. To the left of No. 1 platform are the No. 1 West Bay, the arrival platform for trains from Basingstoke and Newbury, and Nos. 2 and 3 platforms, used for the departure of trains to the Basingstoke and Newbury branches; No. 4, the up main, for all express trains to Paddington; No. 5, the down relief for all stopping trains to Didcot, Oxford, Swindon, Trowbridge and Windsor to Basingstoke trains. These two platforms, Nos. 4 and 5, form an " island " 1,150 ft. long by 50 ft. wide, with a bay at each end used for local trains. No. 6 is the up relief for stopping trains to Henley, Maidenhead, Wycombe, Windsor, Uxbridge, Staines and Paddington. This platform is 900 ft. long and 20 ft. wide. There is also a bay line on this platform for up local trains. On it are luggage and cloak room, assistant stationmaster's office, and waiting rooms. A subway 300 ft. long by 20 ft. wide runs the entire station width, with luggage lifts to each platform and stairways for passengers. There is a booking office at the north end of subway. Ten lines run through the station. From the high level ground frame to Scours Lane all goods trains are diverted to run to the marshalling sidings at Reading West Junction. For detailed particulars of the station and of the signalling arrangements, reference may be made to an article by Mr. W. E. Edwards which appeared in the RAILWAY MAGAZINE, February and March, 1910.

On the north side of the station are the extensive signal engineering works of the company, also another portion of the goods yard, the greater part used for coal traffic. About 200 yards west of the station is the important Berks and Hants Junction —the point of divergence of the Castle Cary route taken by the West of England expresses. This junction has recently been vastly improved at considerable cost, enabling the speed restriction to be raised from 20 miles to 40 miles per hour. On the left are carriage sidings, and in the triangular piece formed by the diverging lines with the west curve for the third side are the engine sheds, locomotive sidings, and coal stacks. Continuing down the older main line, we notice in succession, on our right, the cattle pens, the depôt of the

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"Bridge Department Engineering Dept.," the yard and shops of the telegraph dept., adjoining which are the yard and workshops of the Engineering Department Permanent Way Maintenance. This is the depôt for a considerable number of mechanics of all trades who work throughout the Reading district (Paddington Division), which extends from Southall, Northolt Junction to Kennington Junction, Princes Risborough, Newbury, Winchester, Basingstoke, and branches. After passing some "cripple" sidings, used for repairing privately owned coal wagons, we come to the West Junction marshalling sidings, one of the most important shunting depôts on the Great Western system. Here are made up trains to and from Basingstoke and the London and South Western Railway; to and from the South Eastern and Chatham Railway; and for all parts of the Great Western system. For a mile and a quarter further the line is still within the county borough, and includes the station of Tilehurst, which is used for the extreme west of Reading, and often by military to and from Reading Barracks.

At the Berks and Hants Junction, along the Newbury and Basingstoke line, in about three-quarters of a mile we come to Reading West station, built seven or eight years ago as a passenger station only. Another three-quarters of a mile farther on we approach what is practically a triple junction—to the right the line to Newbury and the West, the centre line to Basingstoke and the London and South Western Railway, while the left is the Coley Branch for goods only, constructed a few years ago and having a terminal station known as Reading Central Goods. This line was made—another testimony to the progressive policy of the Great Western Railway—to relieve the congestion at the chief goods station and at the same time, as its name implies, to give a more convenient depôt for the trade of the centre and south parts of the town.

The signal boxes controlling the Great Western line in Reading are Kennet Bridge (8 levers); Main Line East, controlling the passenger junction with the South Eastern and Chatham Railway (115 levers); High Level Ground Frame (13 levers); Main Line West Box (208 levers). The last mentioned controls the Berks and Hants Junction, and is the largest manually worked box on the Great Western. Snow Hill (Birmingham) has more levers, but is worked electrically. The frame in this box was put in position during February of last year, replacing an old 185 lever frame, and was made at the Reading Works. By courtesy of the *Great Western Railway Magazine* illustrations are reproduced showing the underside of the locking frame and the interior of the box. The alterations to this signal box were involved in the relaying of the Junction. A

Photo] [*G.W.R.*

GENERAL VIEW OF READING STATION, GREAT WESTERN RAILWAY.

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middle box with 21 levers at the west end of the up relief platform controls shunting operations in connection with up relief passenger trains.

Along the main line the next box is the Goods Line West (43 levers), then Reading West Junction (101 levers), followed by Scours Lane Junction (39 levers), Tilehurst Station (41 levers), and Tilehurst Ground Frame (4 levers). On the Berks and Hants line, Oxford Road Junction (26 levers), this box also controlling Reading West station signals; Southcote Junction (34 levers), controlling the triple junction previously described, and finally, Reading Central Goods (3 levers).

As showing the importance of the railways to Reading, it may be added that the gross estimated rental of the Great Western Railway within the borough for rating purposes is placed at £42,416, the rateable value at £29,654, and of the South Eastern and Chatham at £3,416 and £1,964 10s. respectively.

Mr. J. H. Noble, the Reading stationmaster, Great Western Railway, belongs to an old railway family. His father served the Great Western Company nearly fifty years; his elder brother, now retired from the service, was formerly stationmaster at Reading. Another brother is in charge of Slough station.

Mr. Noble entered the railway world as lad clerk in the goods department at Bath in December, 1871. As Goods Clerk he was removed to Hockley station, Birmingham, November, 1874; Taplow, 1877; Windsor, June, 1882. Appointed Relief Clerk, March, 1885, he was made stationmaster at West Drayton, February, 1896, removed to Southall, February, 1900, and finally took up his present post at Reading, March, 1908.

The importance of the position Mr. Noble so ably occupies at Reading is emphasised by the fact that connected with his station there is siding accommodation for 3,100 wagons; the passenger and parcel receipts for 1912 amounted to £128,406, the number of passengers booked being 539,082.

The Great Western stationmaster's staff numbers 278 in the summer and 276 in the winter. These figures are arrived at as follows:—assistant stationmaster, 1; clerks, including four lady telegraphists, 23; yard master, 1; inspectors, 10; ticket collectors, 14; foremen, 8; passenger guards, 15; goods guards and brakesmen, 32; signalmen and signal porters, 38; shunters, 50; telegraphists for cabins, 6; porters of various grades, 78. In summer the station is provided with one extra inspector and one extra ticket collector.

Mr. E. Gratwick, station superintendent, South Eastern and Chatham Railway, Reading, began his career as telegraph learner with the London, Chatham and Dover Railway at Victoria station, London, over 40 years ago. His transfers were:—Sittingbourne, as telegraph clerk; to Bromley first and later to Ramsgate as booking clerk; then as stationmaster successively at Birchington, Swanley Junction, Sevenoaks, Ashford (where he opened the new station), Gravesend and Rosherville (also new stations), thence to Maidstone, where he had charge of passenger and goods departments until the working agreement was made between the South Eastern and the London, Chatham and Dover Railways. Mr. Gratwick then took charge as passenger representative of Maidstone East, Maidstone West, Maidstone branches and Tovil, being responsible for marshalling and shunting in both goods and passenger departments. After eighteen years in this capacity, he was transferred to Reading, and there placed in full charge of passenger and goods departments of the South Eastern and Chatham Railway.

Mr. Gratwick is further concerned in London and South Western Railway work at Reading, as his company there perform for the South Western all outside work such as shunting and train forming. In the passenger department the London and South Western Railway possess a staff of clerks, and in the goods department an agent assisted by clerks, an inspector, checkers and porters, but much of the outside work is performed by the South Eastern and Chatham Reading staff, the total number of whom, including men in the locomotive department, is about 250. With so many interests to safeguard and such varied duties, an officer of ripe experience like Mr. Gratwick is necessary for the important position he holds.

In conclusion the writer expresses his thanks to the Chief Engineer (Mr. W. W. Grierson) and other officers of the Great Western Railway; to the editor of the *Great Western Railway Magazine*; to Mr. F. H. Dent, General Manager of the South Eastern and Chatham Railway; to the Town Clerk of Reading; and to the stationmasters of the two stations for information and other assistance readily given for the purposes of this article.

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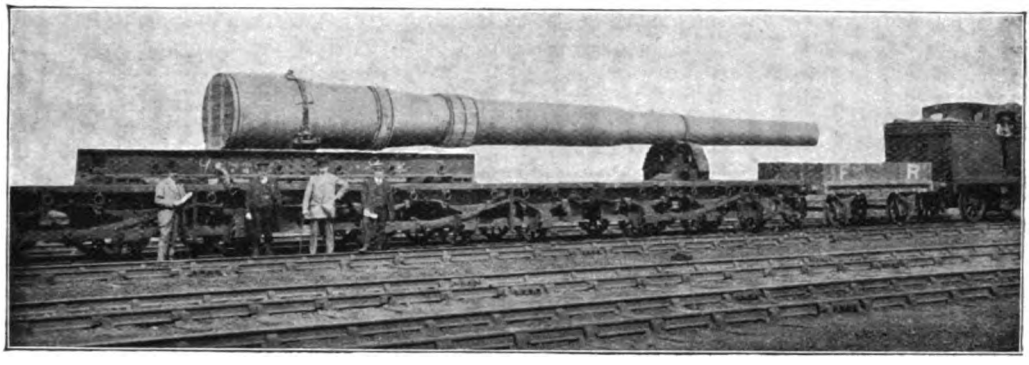

81-TON GUN.

BARROW TO MIDDLESBROUGH, FOR SHIPMENT TO JAPAN.

Wagon Capacity.

By G. W. BUCKTHOUGHT.

THIS is the day of big things, of super-dreadnoughts, skyscrapers and monster locomotives. The cult of the gigantic is upon us, and we are ready, every one of us, to fall down and worship any image be it only Big. Superman is our surname. We think in millions, and then risk all to make real our dream. Success, to earn our recognition, must be magnificent. Failure, to impress us, must be tremendous. It is not surprising, therefore, to find the attention of railwaymen directed ever and again to the subject of big rolling stock. "Are our wagons too small?" is the question put to each fresh batch of officers. "Are they economical?" Let us examine the case.

The size of a railway wagon best suited to economical working, that is, the capacity which will make the wagon of the most use in the haulage of traffic is to be ascertained, firstly, by finding the average unit of purchase in the district served by the railway. The size of the average consignment forwarded decides to a large extent whether the wagon adopted for general use by the railway should be one of huge capacity or otherwise. If the average unit of purchase be small and wagons of large capacity are used, the result is obvious. There will be either considerable delay in the transit of the traffic through the wagons being kept waiting for a fair load, or the habitual use by the traffic department of a large amount of the power it is debited with in hauling unnecessary dead weight. One of the great principles of railway working is to handle the traffic as little as possible, as handling is costly. It is; therefore, evident that the relation between the size of the wagon and the average load is most important. The securing of through wagon loads means that much expensive re-handling of traffic is avoided.

To trace the determination of the size of the unit of purchase to its prime causes is interesting work. The standard of the transport service in the country is the chief factor. If the journeys generally taken are characterised by cheapness, frequency and comparative shortness, merchants will certainly not buy in large quantities. If, on the other hand, the markets are a long way off, they will perforce have to deal in large lots. Consider now how this affects traders and the railway companies respectively. For tradesmen, business transacted on a small-consignment basis means a saving of capital which would otherwise be spent in providing barns and storehouses. There is also the saving of charges for insurance against the risks attached to storage. Traders have transferred this burden to the railway companies. The main essential in the situation is quick transit and prompt delivery, and, thanks to the effect of competition—that friend of the trader who does not happen to have money invested in railway stock—the companies have wholly yielded to the demand for increased speed. Fortunately, both for traders and the

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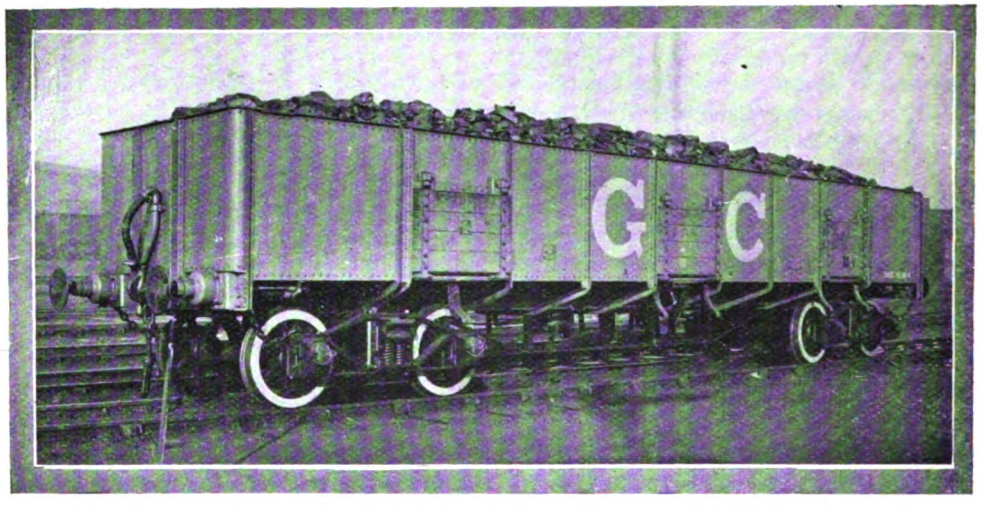
railway companies, the co-operative influence of the Railway Clearing House has prevented rate-cutting, and directed competition into such channels as service-acceleration, the free rendering of services only incidental to rail conveyance and the provision of what are actual comforts and luxuries. The result is faithfully reflected in the average dividend now paid by the railways.

The economical working of small consignments tests the skill of the railway official. To arrange quick transit cheaply is a difficult task. There is often not enough time to obtain full loads for even small wagons, and, unless the proportion of load to tare be a fair one, all the good management in the world will not make the business pay. It is with the object of increasing the ratio of paying load to dead weight that transhipping arrangements are made. Transhipping may, if the traffic passing be large enough, result in a speedier service, but, generally speaking, one must consider the process as taking up additional time—a very serious matter under competitive conditions. Then again, transhipment means increased expense. There is the cost of the extra handling and the provision of proper facilities if the work is to be done well. The promptitude with which business has to be conducted is a great factor in this problem, and the extent to which railway companies meet the requirements of traders is an investment that will bring a sound return. It may be true that the railway is the servant of Trade. Yet it must not be overlooked that the permanent well-being of either is guaranteed only when the other's interest is preserved. Both should make their arrangements and adjust their demands with an eye to the full and ultimate effect. The American situation in this respect is the reverse of the English one. There, railwaymen, being freer from Government control, have taken the case into their own hands, and made business men adapt their arrangements to economical railway working. The consequent advantage both to the trader and the railway company is a real one. Traders get facilities at an exceptionally low price, and some of the railway systems have become as prosperous as gold mines of the sound sort. Dividends are high, while rates are low.



30-TON ALL-STEEL BOGIE COAL WAGON: GREAT CENTRAL RAILWAY.

Many examples could be given and multitudes of others suggested where wagons of very high capacity can profitably be used. For instance, on the northern lines, gigantic trucks have been put into traffic for conveying the heavy compact bales of cotton and wool. Wagons of similar capacity have been built for the transportation of rails for the permanent way department. Wood-pulp, timber, sand and other mineral traffic have also been specially catered for in this way. Further cases might be mentioned where wagons of a definite capacity could be introduced with economical results. But, granting all, it is evident that it

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will not do for a variety of sizes to be in use on a railway system. The wagon must suit the system, and some uniformity is essential. This point is the outcome of experience, and nowhere has it been brought home with greater force than at gravitation sidings. To prevent breakage of goods it is often necessary for a shunter to be told off to travel with each wagon of high capacity to see it safely through the yard to the departure sidings. Even in engine-worked yards, the shunting would be got through more quickly if the vehicles dealt with were alike in size, weight, and ran with equal ease.

There are decided advantages in securing heavy train loads. With certain qualifications, they mean economy. They can obviously be got by either of two methods —to wit, by the adoption of long trains, or by the use of large wagons. To increase the number of vehicles in preference to using larger trucks is not economical. The capacity of a train is determined by the power of the engine, and this, of course, fluctuates according to the gradient. The size of the engine sets a limit to the weight hauled, and the possible size of the locomotive is determined by the gauge. It is singular, and, in view of the fact that the number of out-of-gauge loads tendered to the railways for conveyance is on the increase, lamentable in the extreme, that the width of the gauge of our railways should be precisely the same as that of the old wooden way at the historic Northumberland Colliery. The question of gauge, the cost and value of the various sizes is a fascinating one, and to settle which is the most economical is not the work of a moment.

The cubic-capacity of a wagon is as important as its weight-capacity. An adequate return for the expense of building wagons capable of carrying, say, 20 tons, will not be realised if they are going to be used chiefly for the conveyance of traffic so light and bulky that they will be full by the time five tons have been loaded into them. In this respect the American has an advantage over the Britisher, as a large proportion of the traffic he caters for is much heavier, bulk for bulk, than that offered to our railways. In the loads he conveys there is not that disproportion between weight and space occupied. Although it is the gauge of the railway that definitely sets the limit to the width of wagons, they could with safety be built much wider than they are on the present rail gauge were it not for bridges, station and other buildings. In fact, their width could be increased to 10 ft. 6 in., which would mean a difference of practically 25 per cent. in floor area. Of the many devices put forward with the view of getting a better proportion of tare to load, Lieut.-Colonel Sir Arthur Yorke's recommendation should be mentioned. After touring the States in 1902, he informed the Board of Trade that an additional depth of three inches in our wagons could easily be obtained without increasing their height, if the diameter of the wheels were reduced to 33 in. —the American size. Metal extensions to fit upon the present wagons have also been put in use, and in many instances these prove to be of great value.

The advantages derived from the use of large-capacity wagons are many and real. Not only are fewer wagons needed to convey the same load, but fewer couplings are required, and this means a considerable saving. There is less tare in proportion to freight carried—in itself an important economy. Sometimes the saving of dead-weight solely through the use of a larger wagon reaches the high figure of 50 per cent. When large wagons can economically be used, more paying load is secured. Haulage of the vehicle itself is dead loss, and the greater the load conveyed the less is the operating expense per ton of freight. There is also less friction in the transit of the train. To overcome the friction set up by the use of the extra smaller sized wagons hauling the same load, a calculable demand is made on engine power. A further important saving is realised in the number of trains needed. Other things being equal, the higher the wagon capacity, the fewer the trains required. In some cases this means that intended widenings of line can be deferred, and instances are not unknown where proposed works of the kind have been postponed indefinitely solely through an improvement being made in the operating conditions even after the necessary expenditure has been officially sanctioned and the work actually commenced.

Again, if the number of trains required to move the traffic be reduced, fewer enginemen and brakesmen are needed. We had better not emphasise this point, lest we offend that large and increasing class of people who stipulate that no improvement should ever be made if it would mean unemployment, and who believe that manpower should first be exhausted before any

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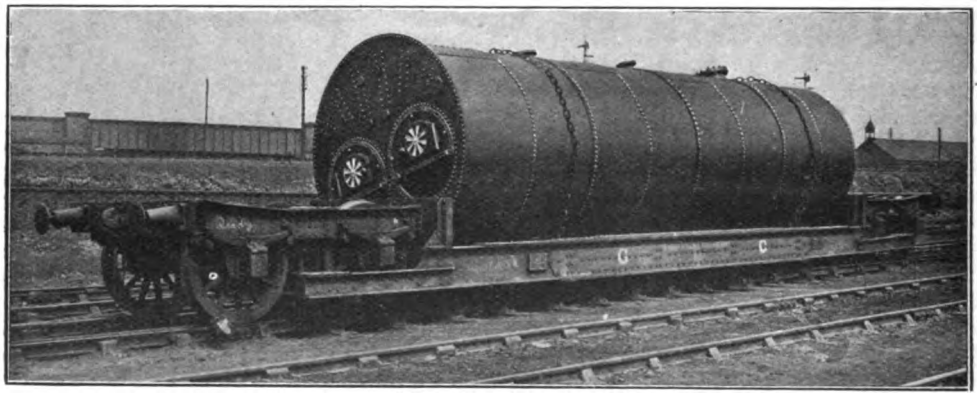
demand is made on horse, steam or any other agency. They may be right, but Ruskin's doctrine is "too hard" for this generation of economists to bear. Civilisation is progressing on the intellectual lines of Nietsche's and Bernard Shaw's *Superman*. Charity may be "the greatest thing in the world," and the idea that "only he is advancing in life whose heart is getting softer, whose blood warmer, whose brain quicker, whose spirit is entering into living peace" may be the highest truth. But such considerations do not govern us. As the servants of shareholders, we intend to make railways pay.

Not only do trains with the heavy paying loads secured through high capacity wagons mean less mileage, but better intervals are obtained on the line for the working. The result is an improvement in the service.



25-TON WELL BOILER WAGON: GREAT CENTRAL RAILWAY.

Yard working also is similarly benefited. It may be remarked that seldom it is these benefits are seen, and it is, therefore, essential to point out that the various branches of railway working are, through their delicate correlation, very sensitive to disturbance. If in each part of the business proper arrangements are not made, any advanced method or improved appliance that may be introduced can quickly be turned into a nuisance. The advantage of heavy train loads secured from the economical use of large wagons is easily rendered null and void if, for example, the timebook be all wrong. But, if we have the right men in charge of the warehouse, the yard, the train service and the line-operating, and all of them are working in harmony, the whole business should work like a top. Wagons will be ready loaded at the psychological moment, the trains despatched at scheduled and *practical* times, and the yards ahead prepared to deal with them when they arrive.

High capacity wagons mean indirectly better yard working. Further, as the same amount of traffic is carried in fewer wagons, less shunting is necessary. Another advantage is that less siding accommodation is required. This point will appeal with particular force to proprietors of collieries or large works whose land may be limited. I have by no means exhausted the points which might be mentioned in favour of wagons of high capacity. In warehouses of recent construction, there can be no question of the advantage they yield in the saving of platform space when allocated for traffic passing in sufficiently large quantities. If they are box wagons, the advantage is even greater, as then they can be loaded to the full height of the gauge. Through the greater cubical capacity obtained, a larger quantity of goods, even of irregular sizes, can be accommodated. The time usually occupied in sheeting is saved, and the loading can be continued, much to the delight of the canvassers, long after the "eleventh hour" has struck.

Many years will no doubt elapse before the warehouse, the yard and the running line become adapted to the increased size of rolling stock, but the expense will have to be met. It is only a question of time. Notwithstanding all this, the results accruing from the use of high capacity wagons are not wholly beneficial. The expense and inconvenience following derailment are increased if the vehicles off the road chance to be these leviathans of the line. In

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addition to the extra care needed in the marshalling yards, the powers-that-be are sorely put to it to find remunerative loading on the return journeys. If they be unsuccessful, the haulage of so much dead weight is a matter of serious concern. But this problem of empty haulage is a constant one for the man gement. To overcome it, is one of the victories that go hand in hand with the abolition of competition and of private ownership of wagons. In face of present competition, railway companies are not going to risk running short of vehicles through the institution of a glorious scheme for common user of wagons. Neither will private owners willingly go to the expense of adapting weighing machines and colliery screens to big wagons for the sole benefit of railwaymen who now discover that, driven by competition, they have gone too far in giving quick transit to small consignments, when a quite reasonable service would have given better loads, more economical working, lower rates, encouragement to traders to deal in larger lots, and so have made practicable the adoption of a bigger unit of rolling stock.

Another Picturesque Railway Tunnel. Where is it?

PREVIOUS ILLUSTRATIONS OF THIS CLASS HAVING AROUSED CONSIDERABLE INTEREST, WE REPRODUCE ANOTHER OF MR. W. W. HOLLIS' TUNNEL PHOTOGRAPHS. THE TUNNEL IN QUESTION IS MORE THAN A MILE LONG, AND IS LOCATED ON A JOINT RAILWAY. READERS ARE INVITED TO SPECIFY ITS NAME AND POSITION.

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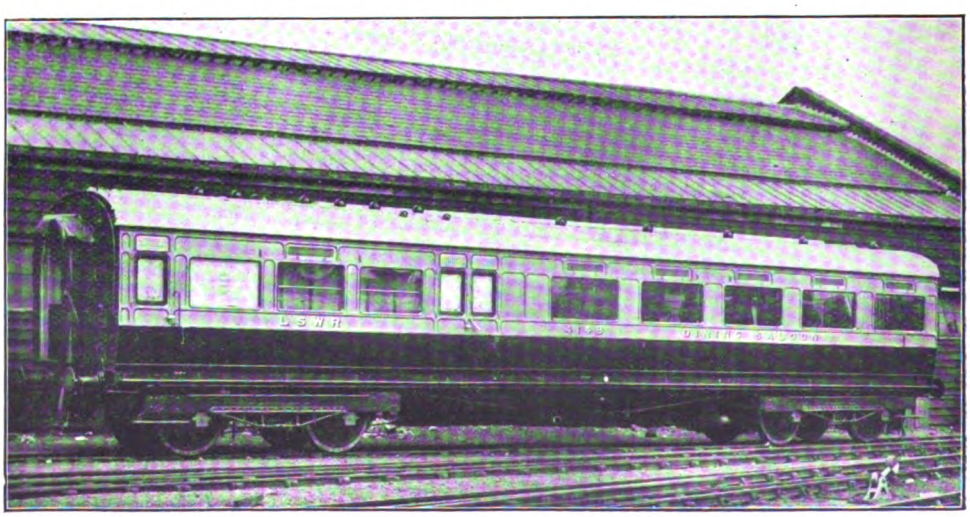
New Restaurant Cars: London and South Western Railway.

THE accompanying illustrations show the exterior and handsome interior of one of the new restaurant cars now running in the London and South Western boat trains between Waterloo and Southampton in connection with the Havre and Paris services. Built at the company's works, Eastleigh, from the design and under the supervision of Mr. S. Warner, Carriage and Wagon Superintendent, these saloons are 56 ft. long over the body, and 8 ft. $6\frac{3}{4}$ in. wide. With high elliptical roofs, which give a maximum air space to the interior, the vehicles are carried on specially designed wide bolster bogies of 8 ft. wheel base, with centres 39 ft. apart, and they "ride" very smoothly. Fitted with flexible gangways, the vehicles are divided into three compartments—one saloon, a kitchen and a pantry, the saloon compartments being subdivided by means of embossed glass screens. Providing 29 seats, the cars are electrically lighted, and special care has been taken in the design and arrangement of fittings to produce a uniform and subdued light. Fans are fixed in the saloon compartments, and exhaust blowers placed in the kitchens for driving out hot air from all the compartments, enabling the same to be supplied with fresh air through the side ventilators. The saloon compartments are finished in mahogany and satinwood, with figured moquette upholstery, and the floor is covered with Staines linoleum. Large windows adjacent to the tables are fixed, but hinged ventilating windows above are provided covered on the outside with fine wire gauze screens to keep out as much dust as possible. The vehicles weigh about 34 tons.



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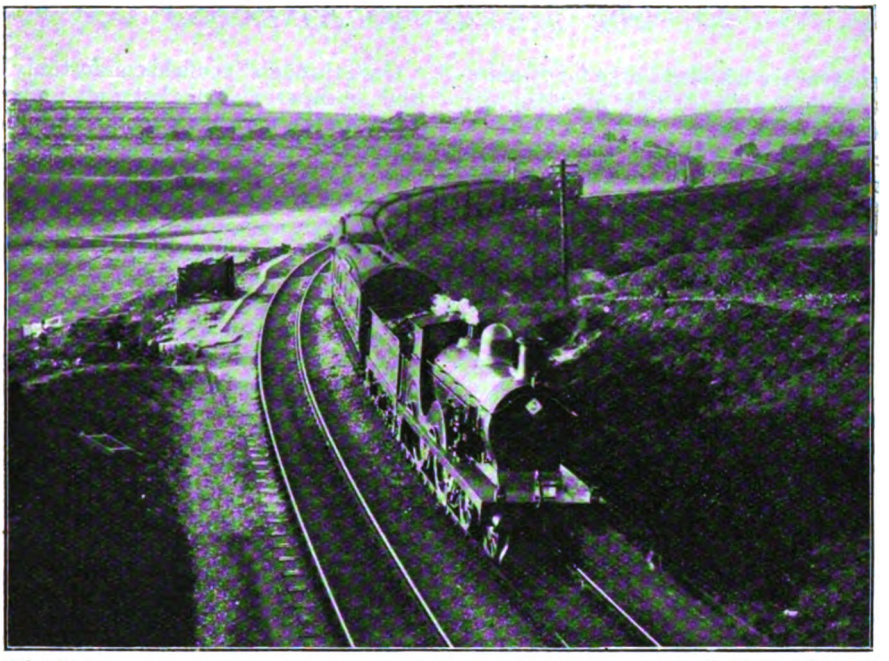

Photo] *R. W. T. Collins.*

SOUTH EASTERN AND CHATHAM RAILWAY:

3.35 p.m. Charing-Cross–Hastings Saloon Car Train approaching West St. Leonards. 4–4–0 locomotive No. 740.

British Locomotive Practice and Performance.

By CECIL J. ALLEN.

AFTER the many months during which attention has been devoted to records of locomotive performance in the North of England or in Scotland, I feel sure that not a few readers of the RAILWAY MAGAZINE will welcome a transference of attention to the work performed in more southerly latitudes. Perhaps I might be permitted at this point to say—in response to letters which I receive frequently enquiring why such and such a favourite line has so long been neglected in the matter of runs—that journeys in many directions are regulated more frequently by necessity than by preference, and that many of those of which readers desire to see accounts in print have to be introduced as opportunity may offer.

I have lately been afforded the welcome opportunity of recording the work of one of the new Great Eastern 4–6–0 superheater engines on that company's "Norfolk Coast Express"—a train which showed off the powers of the new type to the best possible advantage. Magnificent though the work has been that the "Claud Hamilton" class engines have performed on this popular express since the new vestibuled set trains were introduced, there was always the consciousness that a certain measure of "thrashing" the steed was necessary if time were to be kept, even in the least busy weeks of the season. Consequently, after I had for so many years really longed to see what a six-coupled engine could do in such an admittedly difficult case, it was with peculiar pleasure that I seated myself in the down train on a day in July last, to record for the first time the performance of a 4–6–0 engine between London and North Walsham, with the prospect of comparing the notes with those of all my previous trips. No. 1502 was the engine, driven by Pulham, of Ipswich, and the load a substantial one of eleven eight-wheelers and one twelve-wheeled kitchen restaurant car, together

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with an extra six-wheeled brake for Mundesley, totalling 53 axles, or fully 360 tons with passengers and luggage.

From the commencement the work was startling. Despite the half-mile at 1 in 73 up to Bethnal Green, a slight signal check at Bow Junction, and the usual 20 m.p.h. speed order at Stratford, we were through the last-mentioned station, 4 miles 3 chains out, in 7 min. 46 sec. Recovering with wonderful smartness, the next 5 miles 74 chains to Chadwell Heath took only 7 min. 6 sec., the speed having by that time (on a slightly adverse grade almost throughout from Stratford) risen to as much as 55·6 miles per hour. At a rate but little below this the famous Brentwood bank was entered upon beyond Harold Wood, and the three adverse miles steepening from 1 in 97 to 84 only sufficed to lower our speed to a minimum fractionally below 33 miles per hour. Thus, despite the heavy load, Pulham had succeeded in observing the difficult 13-min. schedule for the 10 miles 17 chains from Chadwell Heath to Shenfield to within 4 sec., and we passed Shenfield, 20 miles 14 chains out, in 4 sec. under 28 min. To show how this performance ranks altogether above those normally achieved, I append a brief table of previous runs on this train, and on others booked through Shenfield in 29 min. This table, I think, speaks for itself without further explanation. It is worthy of note that the 15 miles 17 chains from Stratford—passed very slowly—to Ingrave Box, the summit of the bank, occupied only 18 min. 54 sec., although the grades are adverse all the way.

Once through Shenfield comfortably before time, it was evident that any pronounced effort on the part of the engine would make us unduly so before Colchester was passed, owing to the favourable intervening grades. The engine was, therefore, worked under easy steam, no high maximum speeds being recorded. From Shenfield to Chelmsford 9 min. 9 sec. were spent on the 9 miles 46 chains of distance; from Chelmsford to Witham the 8 miles 68 chains occupied 9 min. 50 sec.; and the 13 miles 7 chains thence to Colchester 13 min. 37 sec. Maximum speeds of 69·2 miles per hour were reached before Chelmsford, 64·3 at Witham, and 67 before Colchester, the usual 30 mile-an-hour slack being made at Chelmsford, and a particularly severe one at Colchester in view of permanent way operations in force. Despite the easy running, however, we had passed Chelmsford, 29¾ miles, in 37 min. 5 sec. from Liverpool Street, and Colchester, 51 miles 55 chains, in 60 min. 32 sec.—nearly 3½ min. early. The severe check at Colchester hampered us considerably in climbing the steep 1 in 123-144 rise beyond, the next section being one of the only two on which schedule time was not observed or improved upon. Even then, however, a loss of only 35 sec. was registered, the 7 miles 51 chains from Colchester to Manningtree taking 9 min. 35 sec., with a top speed of 70·3 miles per hour over the viaducts. Excellent climbing followed. The minimum speed at Belstead box after a mile up at 1 in 145 and 2 at 157 was as high as 46·4 miles per hour, and a maximum of 67 was reached on the falling grades before we slacked carefully—after Great Northern

GREAT EASTERN RAILWAY—LIVERPOOL STREET TO SHENFIELD.

Distance. M'le. Ch's.	Engine No. .. .. .. / Driver .. .. .. / Load (axles) .. .. / ,, (tons)	Schedule Time (Mins.)	1867 — 37 260	1871 Cage 44 305	1823 Storey 48 335	1882 Nudd 48 335	1871 Cage 52 365	1502 Pulham 53 360
0 0	Liverpool Street .. dep.	0	0.00	0.00	0.00	0.00	0.00	0.00
1 11	Bethnal Green .. pass	—	3.2	3.36	3.39	3.21	3.35	3.11
4 3	Stratford* .. .. ,,	9	7.46	8.06	8.09	8.17	8.05	7.46
7 27	Ilford.. .. .. ,,	—	12.52	12.43	12.47	12.50	13.02	11.57
9 77	Chadwell Heath .. ,,	16	16.10	15.50	15.58	16.06	16.36	14.52
12 29	Romford .. .. ,,	—	18.48	18.34	18.48	18.49	19.16	17.34
18 14	Brentwood .. .. ,,	—	26.18	26.33	26.47	26.26	27.44	24.45
19 22	Ingrave .. .. ,,	—	28.13	28.34	29.09	28.30	30.06	26.40
20 14	Shenfield .. .. ,,	29	29.33	29.48	30.30	29.45	31.26	27.56
6 73	Romford to Ingrave — Time	—	9.25	10.10	10.21	9.41	9.50	9.06
	Av. S'pd.	m p.h.	44.0	40.8	40.1	42.8	42.2	45.6

*Service Slack—20 miles per hour.

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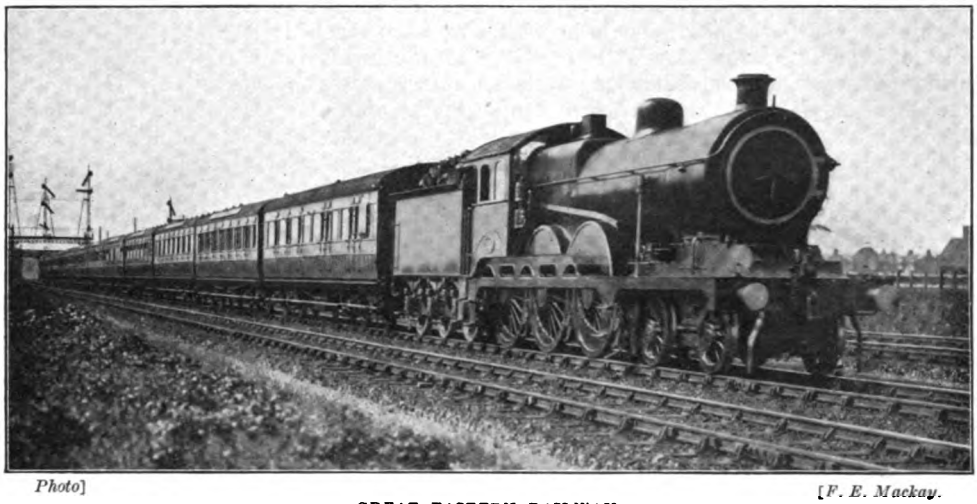
practice—for the troughs at Halifax Junction. Still we were through Ipswich in 10 min. 8 sec. from Manningtree (9¼ miles), and 80¼ min. exactly from London (68 miles 56 chains)—2¾ min. before time.

It was in the uphill work, however, that Pulham showed the greatly enhanced power of his engine as compared with previous standards, and our progress up Haughley bank was as exhilarating as that up Brentwood bank. Indeed, the schedule of these trains, which has always previously seemed too difficult for the "Claud Hamilton" class as regards uphill times, necessitating recovery of time on downhill stretches, seems to fit the capabilities of the new type perfectly, so that the express train ideal of good work uphill and moderate speeds downhill that we had during the journey, a maximum of 75 miles per hour being maintained for some distance. Thus we were carried over the last 2¾ adverse miles up to Tivetshall "tableland"—finishing at 1 in 142—at a minimum of 51·1 miles per hour. Our time from Haughley to Tivetshall, 17 miles 49 chains, was 19 min. 8 sec., against 20 min. booked, and the total time for the 100 miles 44 chains from London 116 min. 2 sec., all slacks included. We now had 4 min. in hand.

The value of the falling grades past Forncett was marred by the service slack now in force over a temporary bridge (replacing that washed away during last August's storm), and as this check occurs at the foot of a sharp rise, it had the effect of causing us a loss of time. A maximum of



Photo] [*F. E. Mackay.*

GREAT EASTERN RAILWAY:

Down Norfolk Coast Express passing Chadwell Heath.
New 4-6-0 locomotive (Schmidt superheater) No. 1505.

is in course of realisation on the Great Eastern Railway. Thus, after a careful slack to 25 miles per hour through Ipswich station, No. 1502 accelerated on the gradually rising grades up the valley of the Gipping to as high a speed as 55·6 miles per hour near Needham, and climbed the culminating three miles of this ascent past Haughley—one at 1 in 148 followed by two at 1 in 131—at a minimum rate of 37·2 miles per hour. Consequently the 14 miles 9 chains from Ipswich to Haughley were covered in the excellent time of 16 min. 49 sec., instead of 17 min. as allotted, and the gain in the next section was yet more pronounced. The falling grades between Finningham and Mellis tempted Pulham to the only real speed exhibition only 65·2 miles per hour preceded the slack for Trowse Upper Junction, and the 13 miles 34 chains from Tivetshall to Trowse occupied 15 min. 9 sec. instead of the 14 scheduled. The third remarkable "climb" followed. After taking the swing-bridge and the Wensum curve at the usual very cautious pace, Pulham accelerated his engine in less than a mile and a quarter of level line to 43·3 miles per hour, and then breasted the 1 in 80 of Whitlingham bank—1½ miles of it—at a minimum speed of 30·8 miles per hour. This, perhaps, was the most astonishing effort of the whole journey. The chief difficulties of the trip were now over, and we "strolled" into North Walsham a comfortable 5 min. early—all but 9 sec.—having

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covered the very difficult 16 miles 10 chains from Trowse in 21 min. 58 sec., instead of the 24 min. booked. From London the total distance is 130 miles 8 chains. This we had completed in 153 min. 9 sec. gross—at an average speed of all but 51 miles per hour throughout—or in a net time of about 150 min., allowing for the extra severe slack at Colchester, and that between Forncett and Flordon.

But what the "possible" time was it is difficult to conjecture, as these engines, like their compeers on the London and North Western Railway, appear to have an unfathomable reserve "up their cylinder," if the parody of a well-known colloquialism may be permitted! I left the train at North Walsham, not forgetting to congratulate driver Pulham on his excellent achievement. As most readers will be aware, the 4–6–0 engines have been used daily on the "Norfolk Coast Express" during the past summer, and up to the time of writing I believe that schedule time has been observed with a modest total of 60 axles, or fully 430 tons. On the Continental boat expresses, however, both of which are now timed through Colchester and Manningtree respectively in 61 and 70 min. —3 min. gain on the times of the "Norfolk Coast Express"—and to Parkeston Quay, 68¾ miles, in 82 min., time has been kept by a 4–6–0 engine with no less than 480 tons behind the tender. Of the exact number of axles on that occasion I am not sure, although I have on more than one occasion since the 4–6–0 engines were introduced on the Continental service seen them booked to take more than 60 axles unaided.

Writing of the Continental express reminds me of an excellent trip I enjoyed upon it several years ago, before any 4–6–0 engines existed, on the old 87-minute schedule. The load was then at its winter level of 7 eight-wheelers, including restaurant cars, 2 six-wheelers, and 2 four-wheeled vans —a moderate total of 38 axles, or about 260 tons in all—and the engine a "Claud Hamilton" of the non-Belpaire type, No. 1867. Good work throughout was performed, of which close adherence to schedule times was the main feature. Stratford was passed in 7 min. 46 sec.; Ilford in 12 min. 52 sec.; Chadwell Heath in 16 min. 10 sec.; Ingrave in 28 min. 13 sec.; and Shenfield in 29 min. 33 sec. The average speed between Brentwood and Ingrave was 32·8 miles per hour, and the excellent time of 13 min. 23 sec. was made, as will be noticed, between Chadwell Heath and Shenfield. Beyond this point no attempt was made to gain on booked times, half-a-minute being in hand. Chelmsford was passed in 39 min. exactly; Witham in 49 min. 33 sec., Colchester in 63 min. 27 sec.; and Manningtree, at greatly reduced speed, in 72¼ min. At this latter point we certainly were 1¾ min. early, but the 13 min. allowed for the 9¼ miles from Manningtree to Parkeston, with the sharp up-grade at the start commenced after a 15 miles-per-hour slack, is a particularly "tight" time, and we took an extra 45 sec. However, this slight loss still left us with a gain of exactly a minute on schedule time, the 68¾ miles having been covered creditably in 86 min. without excessive speeds at any point.

The "Claud Hamilton" type of engine on the Great Eastern Railway may be said to have reached the zenith of its achievements during the fine summer of 1911, the unfortunate flood visitation in Norfolk and the generally bad weather having done much to upset the summer working in 1912. On the "Norfolk Coast Express" during 1911 very fine work was achieved. An analysis of the complete three months' operation of this express during that year reveals the fact that, with an average load of 49 axles or 340 tons on the down journey, and 51 axles or 355 tons on the up, the average daily gains on schedule time achieved by the locomotives works out at 1·63 and ·69 min. per trip respectively. Some of the runs were really remarkable. A table which I compiled for the *Great Eastern Railway Magazine* at the conclusion of that season, giving details of 30 of the best runs on this train, afforded me no easy task in the selection, so uniformly good was the running, but it is worth quoting. Times given are only approximate, to the nearest half-minute, but may be accepted as quite accurate. The palm in that year might be awarded to driver Nudd, of Norwich, working engine No. 1882, of the non-Belpaire variety. As regards starting times from London, he worked a train of 56 axles, or fully 400 tons, past Shenfield in the scheduled time of 29 min.—a truly marvellous feat for an engine of this size—one of 48 axles, or 335 tons, in 28 min., and one of 44 axles, or 310 tons, in 27½ min. from Liverpool Street.

On the last-mentioned occasion his net time to North Walsham, after allowing for two serious delays *en route*, was one of 149½ min. for the 130 miles, or no less than 8½ min. under schedule time. On the second

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of the three runs cited above he took his 335-ton train through Ipswich, 68¾ miles from London, in 79 min. from the start. An equally fine up journey stands to Nudd's credit in that he brought a train of 400 tons from North Walsham to London in 156 min., or 154 min. net, representing gains of 3 and 5 min. respectively on schedule. With 52 axles, or 365 tons, on the down train several other drivers also did very well, Storey on No. 1823 reaching North Walsham in a net time of 153 min., Cage on No. 1809 and Bell on No. 1884 in actual times of 155½ min. each, and Cupper on No. 1825 in one of 156 min. A further striking feat was that of Sutton, on No. 1800—an engine with

Similar excellence characterised the working on the up journey. Beyond Nudd's feat with 400 tons already mentioned, the same load was worked up by Cupper in 155 min. net, by Bell in 157 min. actual, and by Ellis (No. 1888) and Cage in actual times of 157½ min. each. The schedule time will be remembered as 159 min. With 360 tons Storey reached London in a net time of 155½ min., while with the standard set train of 48 axles, or 335 tons, Sadler (No. 1812) gained 5 min., and Penman (No. 1826) 4 min., both allowing for delays, while Cupper made the run in 155 min. actual time. Some fast running included a record of 12½ min. for the 14¼ miles from Haughley to Ipswich,

Photo] [*F. Williams.*

GREAT NORTHERN RAILWAY:

3.40 p.m. express goods train. 4–4–2 locomotive No. 283.

mechanical lubrication—who worked a 310-ton train to North Walsham in 150 min. net, or 8 min. under schedule time, taking only 28 min. to pass Shenfield and 79½ min. to pass Ipswich. Among speed achievements on the down journey stands Storey's time of 31 min. for the 31½ miles from Shenfield to Colchester, with 330 and 360 tons respectively—a feat equalled by Lincoln on No. 1815 with 355 tons—also Nudd's exceedingly fine time of 39 min. for the 39 miles from Chelmsford to Ipswich with 310 tons, including, as does the latter stretch, the trying gradients between Colchester and Ipswich. The schedule times for these two "spurts" are 35 and 44 min. respectively.

made by Storey with 365 tons, while the same distance was covered in 13 min. on three occasions, by Sadler and Ellis in the runs already mentioned, and by the late driver Barnard. He was then driving No. 1813, and had a load of 335 tons. Another fast stretch is from Shenfield to Stratford, 16¼ miles beginning with a steeply adverse mile, culminating a 10½ miles' ascent. Cupper, with his 400-ton train-load, covered this in 15½ min. One of the finest feats on the up journey was that of driver Cupper, who on the same run passed Tivetshall, 29½ miles from the start, in 39½ min. with this huge train, thereby gaining as much as 3½ min. on the most difficult section of the

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journey. I make no apology for reproducing these details, as to me they represent some of the very finest work ever recorded with non-superheater 4–4–0 engines.

As a contrast in train loads, one could not do better than turn to locomotive performance on the Great Central Railway, and, as foreshadowed in last month's article, I will devote the remainder of this contribution to experiences on that line. It is always a matter of regret to me that I do not get more opportunity of travelling by the Great Central Railway, whose locomotive exploits regularly reach a high level of interest. But in the three trips now to be described, particularly those on the London extension, I enjoyed the greatest good fortune in the matter of achievement. First and foremost, I have no doubt that many readers will be pleased to see some record in print of the work of the new 4–6–0 engines of the "Sir Sam Fay" type, one of which I recently timed over the difficult stretch of line between Manchester and Sheffield. The train was the Grimsby and Harwich Continental Boat Express, leaving Manchester (Central) at 3.20 p.m.—the load a mere featherweight, for so vast a locomotive, of 7 eight-wheelers, or 195 tons, and the engine No. 426, *City of Chester*. We started 2 min. late—would that it had been later!—and nothing more was attempted than to regain this loss. Fallowfield, 5¾ miles out, was passed in 9 min. 5 sec. at 52·9 miles per hour, and Guide Bridge 11¼ miles, in 17 min. 10 sec., at a reduced rate of speed. The last 5 miles of this distance form the commencement of the steep 22-mile up grade which continues to the end of Woodhead Tunnel. On the 1 in 97 beyond Guide Bridge our speed had fallen to a fraction over 40 miles per hour, but on the succeeding 3¼ miles at 1 in 185, 143 and 562 to Mottram, it rose to 47·4 miles per hour—a smart piece of work. Dinting, at the end of a further 1¼ miles at 1 in 122, was passed in 9½ min. from Guide Bridge (7 miles).

The climb then begins in earnest, the succeeding grades being 2½ miles at 1 in 100, 5 at 1 in 117 to the mouth of the tunnel, and 2¾ at 1 in 201 to its eastern portal. On the 1 in 100 our speed fell to 37·1 miles per hour, recovering, however, to 40·9 on the 1 in 117, so that the 7¼ miles from Dinting to Woodhead took 11 min. 20 sec. Seventy seconds were gained on schedule time between Guide Bridge and Woodhead. Once in the tunnel, however, speed fell rapidly, but as the atmosphere was already very thick, I presumed that the driver must have been taking things easily, as timekeeping was now assured. Consequently a minimum of 36 miles per hour was reached on the 1 in 201, with the result that the 3 miles from Woodhead to Dunford Bridge took as much as 5 min. 10 sec. This gave a total time of 43 min. 10 sec. for the 28½ miles from Manchester, entirely on steep adverse grades, except just at the start. Beyond the summit the pace was quite cautious, and much of the running without steam. No higher speed than 64·3 miles per hour was reached. So the 6 miles from Dunford Bridge to Penistone, where a careful slack was made, took 7¼ min.; the 10¼ miles thence to Wadsley Bridge 10 min. 50 sec.; and the last 2¾ miles to the Sheffield stop 3 min. 55 sec. This gave a total time of 65 min. 10 sec. for the 47½ miles from Manchester, and showed, therefore, a gain of all but 2 min. on schedule. It would be idle, however, to suppose that such a run in any way demonstrated the full capabilities of the new type, of whose work I hope to secure further records at an early date.

On the London extension, however, I have enjoyed a "feast of good things." To the unabashed speed enthusiast, whose simple aim and object is that of securing records of lightning speeds, the Great Central main line may be commended as affording a constant succession of such *maxima* under the most ideal conditions. The two trips about to be chronicled are indeed quite the "last word" in the matter of speed. Both were made on "crack" trains—in the one case the 3.25 p.m. *ex*-Sheffield, calling at Nottingham, Leicester and Woodford, and conditionally also at Brackley, due in Marylebone at 6.46 p.m.; the other the well-known 3.15 p.m. "Sheffield Special," non-stop to the cutlery city in 3 min. under 3 hours from London. Loads were light, the weather calm and fine in each instance. Taking first the up journey, we left Sheffield 5 min. late with a load of only 5 eight-wheelers, representing about 155 tons coach-load, as some of the latest stock was included, and hauled by "Atlantic" No. 261. The start was brisk, Darnall, 2 miles, out being passed in exactly 4 min., despite the steep initial grade at 1 in 144. We slacked carefully for the opening out of Darnall Tunnel—a service slack likely to last for some considerable time—so that the 4¼ miles from Darnall down to Beighton occupied 5 min. 35 sec. But good work followed on the rising grades to Staveley, this 5¾ miles, much

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of which are adversely inclined at 1 in 165 and 1 in 176, occupying 7 min. 5 sec.

The first 12 miles had thus occupied 16 min. 40 sec. Here a blank in my notebook bears testimony to the unfortunate fact that I relapsed for a brief period into the arms of Morpheus, and so failed to record the passing time at Heath, or the minimum speed up the long 8-mile grade which begins at Staveley, and of which the major part is inclined at 1 in 100. My next time recorded was Kirkby, at the end of the undulating table-land succeeding the climb, the 14½ miles from Staveley having taken 19 min. By a swift descent the 11¾ miles into Nottingham were covered in 12 min. 55 sec., despite very slow running approaching the Victoria station, and we drew up in 48 min. 35 sec. from Sheffield, or 47 min. net, allowing for Darnall check. The schedule for this 38¼ miles is as much as 50 min., to allow for cautious running through the colliery districts. By a slight curtailment of the Nottingham stop, we left only 3 min. late, but with a load increased by a further eight-wheeler, and a four-wheeler, now totalling quite 190 tons. Ruddington, 4¼ miles, was passed in 6½ min., and the adverse 4 miles beyond, principally at 1 in 176, were covered in fine style, at a minimum speed of 52·9 miles per hour. Loughborough, at the foot of the brief 2-mile descent beyond, was passed in 16 min. 5 sec. (13½ miles) at 71·4 miles per hour, and good time would have been made up the more gradual rise into Leicester, but for a permanent way check at Belgrave. So the tight 26-min. booking to Leicester was not observed, although our net time did not exceed this figure. The gross time for the 23½ miles was 27 min. 35 sec. At Leicester we lost the services of No. 261 and took on No. 1088, of the same type, for the journey to London.

The start from Leicester is not easy, consisting as it does of 4 gradually rising miles to near Whetstone, followed by 6½ up at 1 in 176. However, we attained 54·2 miles per hour on the gradual grades, passed Whetstone (4½ miles) in 7 min., and did not fall below 48 on the 1 in 176. The slight drop into Lutterworth raised our speed to 68.1 miles per hour, and we passed this town. 13 miles from Leicester, in 17 min. 10 sec. After surmounting the short bank beyond, the 3 miles at 1 in 176 down to Clifton Mill tempted our driver to his first speed exhibition, a maximum of 80·3 miles per hour being maintained for a short distance, while, after surmounting the little "hump" on which Rugby station stands, the speed was again 75 miles per hour through Braunston. The 19¾ miles to Rugby had taken only 22 min. 55 sec. and the 24½ miles to Braunston 26 min. 40 sec. On the second adverse bank of 6½ miles at 1 in 176—to Charwelton—the speed fell to 45 miles per hour, the rapid drop in speed being almost as noticeable in Charwelton Tunnel as it had been on the previous occasion through Woodhead. But with this fairly heavy train the tight 38-min. booking to Woodford—a 34-miles' run—was observed, save for a fractional loss of 10 sec. We had left Leicester 5 min. late, but quick station work at Woodford reduced the arrears to 4 min. The schedule time allowed for the 69 miles to London is 79 min., and this, moreover, includes a conditional stop at Brackley that we were destined to make, under which circumstances the timing is none too easy. No. 1088 covered the undulating 9¾ miles to Brackley in 12¼ min. —a very smart piece of work—and after a stop of the Underground Railway pattern, lasting but 20 sec., we started off on a a remarkable race to London.

Photo] [*H. T. Worlock.*

GREAT CENTRAL RAILWAY:
3.15 p.m. down Sheffield Special, near Neasden. 3-cylinder compound locomotive, No. 364, *Lady Henderson.*

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The 12½ miles to Grendon Underwood Junction are mainly falling, at the ruling grade of 1 in 176, and on this length we ran freely at 81·8 miles per hour, passing the last-mentioned point in just under even time, or, to be exact, in 12 min. 25 sec. A decided slack was made here, and a more pronounced one at Quainton Road, but speed rose to 66·2 miles on the undulating length thence to Aylesbury, the 8¾ miles from Grendon taking exactly 8¾ min., slacks included. The 21¼ miles from Brackley to Aylesbury had, therefore, occupied 21 min. 10 sec. But the feature of the run lay in the uphill work on the Metropolitan line, and this was really wonderful. The 7 miles up from Aylesbury—nearly all at the steep grade of 1 in 117—reduced our speed no more than to a minimum of 49 miles per hour; the brief 2-mile drop to Missenden showed a maximum speed of exactly 75; and, after the short level interval, the final 3 miles up to Amersham, 2¼ of which are in 1 in 160, did not bring us below the mile-a-minute rate. Consequently our time from Aylesbury up to Amersham, 14½ miles, was the truly remarkable record of 15¼ min., and from the Brackley start to this point, 35¾ miles, 36 min. 25 sec. On the steep drop into Rickmansworth we touched 76·3 miles per hour, and, slacking carefully for the station, accelerated up the 2½-mile rise to Northwood (1 in 140 and 176) to 52·9 miles per hour. After this the most moderate running into the terminus ensued, with a slack through Harrow, and a veritable "crawl" past Brondesbury. The actual times were: Amersham to Rickmansworth, 6¼ miles, 5 min. 55 sec.; Rickmansworth to Harrow, 8 miles, 8 min. 35 sec.; and Harrow to Marylebone, 9¼ miles, 11½ min., a figure which could easily have been cut to 10 if necessary. So our total time, conditional stop included, was only 75 min. from Woodford—4 min. under schedule—and from Brackley to London the 59¼ miles had been covered in 62 min. 25 sec. As just mentioned, this could have been reduced without difficulty to as little as 61 min., but, as it was, we arrived "dead" on time.

By the "Sheffield Special" the journey was, perhaps, not quite so noteworthy, although on the score of speed it was an exciting trip. On this occasion the engine was No. 263—again a simple "Atlantic"—and the load four of the newest eight-wheeled vestibuled coaches, together with the usual Leicester slip-coach, totalling 165 tons. The early stages of the run were not of particular note, no great effort being made until we had passed Grendon. Thus we took 14 min. 5 sec. to Harrow (9¼ miles) 22 min. 25 sec. to Rickmansworth (17¼ miles), 32 min. 40 sec. to Amersham (23½ miles), 46 min. 50 sec. to Aylesbury (38 miles), and 55 min. 55 sec. to Grendon Underwood, 46¾ miles from Marylebone. Maximum speeds were touched of 70·3 miles per hour approaching Rickmansworth, where, as usual, a severe slack was made, and 71·4 miles per hour at Missenden, but only of 65·2 on the descent to Aylesbury, which was passed at a very cautious rate. The uphill work also was not very brilliant to this point, speed falling to under 39 miles per hour at Amersham. Beyond Grendon Underwood, however, there was a decided quickening. The long grades culminating at Helmdon were surmounted in great style, no lower speed than 56·3 miles per hour being registered on the first 9 miles—all adverse but 1¼ miles, and 5 at 1 in 176—and the minimum on the second continuous 4½-mile stretch at 1 in 176 past Brackley being 54·2 miles per hour. Owing to this exceptional effort, and to the helpful effect of the 1¼ miles down at 1 in 176 beyond Finmere, which yielded a maximum of 70·3 miles per hour, our time for the 12½ miles from Grendon up to Brackley was only 12 min. 40 sec., and from Brackley on to Woodford, with a further 70·3 record down the short Culworth bank, the 9¾ miles took 9 min. 35 sec. This gave exactly "even time" from Grendon to Woodford—a wonderful achievement, considering the road.

Beyond Woodford we encountered a bad relaying check, the 2½ miles to Charwelton taking 3 min. Then began the chief speed exhibition. Down the bank to Braunston we reached and maintained a top speed of 81·8 miles per hour for some distance. On the Rugby "hump" this figure was reduced to 64·3, but an acceleration to 73·8 was again registered just beyond. The broken rise to beyond Lutterworth, including its 4½ miles at 1 in 176, brought us down to exactly 60 miles per hour, and then the speed gradually rose until, for several miles at the foot of the bank, we maintained an even rate of 85 miles per hour. It is due to the great Central authorities to say that, at this high speed, despite the lightness of the train the perfect smoothness of the running left nothing to be desired, and spoke very well both for the design of the coaching stock and the maintenance of the track. As

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regards times, our time from Charwelton (passed slowly) to Rugby, 11¾ miles, was 10 min. 20 sec.; from Rugby to Lutterworth, 6¾ miles, 6 min. 20 sec.; from Lutterworth to Whetstone, 8½ miles, 7 min. 5 sec.; and from Whetstone to Leicester—passed at reduced speed—4½ miles, 3 min. 55 sec., giving a total of 27 min. 40 sec. for the 31½ miles from Charwelton, 52 min. 55 sec. for the 56¼ miles from Grendon, and 108 min. 50 sec. for the 103 miles from London. This is practically as scheduled.

Getting away quickly from Leicester slack, we were once again doing 80·3 miles per hour at Loughborough—the third 80 record within 35 miles!—passing that town, 10 miles from Leicester, in exactly 10 min., and we did not drop below 60 on the 2¼-mile rise at 176 to East Leake. On the descent to Ruddington we touched 77·5 miles per hour, and then took matters easily. The 12¾ miles from Loughborough to Arkwright Street occupied 11 min. 5 sec., but the ¾-mile thence to the centre of the Victoria station at Nottingham, passed very slowly, took exactly 1½ min. Thus the 23½ miles from Leicester to Nottingham occupied 22 min. 35 sec., and the latter point, 126½ miles from London, was passed in 131 min. 25 sec. Only 74 min. had been taken for the 79 miles from Grendon to Arkwright Street, including Woodford check and Leicester slack, while a still faster time was that from Charwelton to the latter point, 54¼ miles, covered in 48¾ min. Beyond Nottingham the work was still good. The 11¾ miles up to Kirkby, mainly at 1 in 130, were completed in 15¾ min., the average on the last 6 continuous miles at this grade being only fractionally below 48 miles per hour. The undulating 8½ miles to Heath took 9 min. 5 sec.; the 6 miles down to Staveley, where we slacked, 5 min. 40 sec.; and the broken 7 miles to Woodhouse 7 min. 10 sec. At the conclusion of the short climb to Darnall came the tunnel slack, so that the last 5 miles into Sheffield occupied 7 min. 25 sec.; but even then we had covered the 38¼ miles from Nottingham in 45 min. 5 sec. Our total time from London was 176½ min. for the 164¾ miles, so that we finished with ½-min. in hand, though the net time did not exceed 174 min., despite the sluggish start. It is worthy of note that the net time for the 118 miles from Grendon to Sheffield was exactly 118 min., the gross time being only 120 min. 35 sec., so that this was an exceptionally fast run.

Photo] [*W. Bradshaw.*

GREAT CENTRAL RAILWAY:

Cardiff–Newcastle luncheon car express, near Belgrave.
4–4–2 locomotive No. 264.

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Old Time Railway Illustrations.

By W. E. EDWARDS.

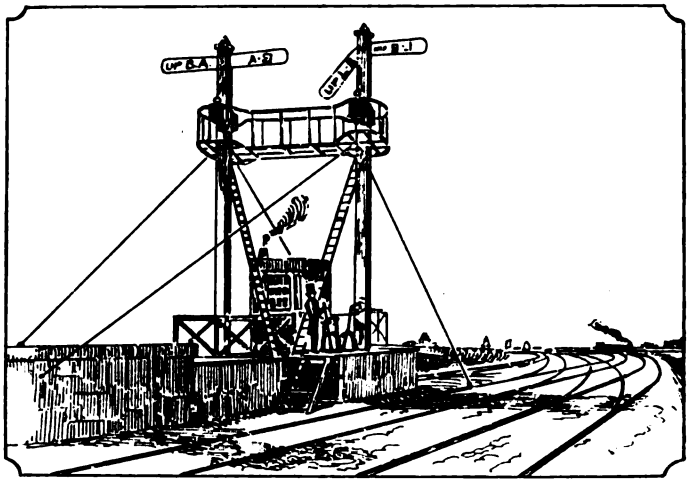

FIG. 1. JUNCTION SIGNALS CONTROLLING THE BRICKLAYERS' ARMS BRANCH AND THE CROYDON RAILWAY (1844).

IT has already been related in these columns that a rudimentary step in the direction of systematic Junction Signalling was made during the year 1844, if not indeed, before the close of the previous year, by Mr. C. H. Gregory, of the London and Croydon Railway. That Engineer, as then stated, was the first to erect a raised stage, upon which a "Stirrup" signal frame was placed thus not only gathering together the actuating apparatus in a convenient manner previously unknown, but likewise placing the man in charge in a position which greatly facilitated the proper observation and direction of the traffic. The important fact was also noted that to the stirrups was eventually added a parallel gear apparatus, which so controlled their action, that conflicting signals could not be given, while finally another inventor, by a further step, combined in one the interlocking of points and signals during the year 1856, that apparatus, as before noted, being fixed at Bricklayers' Arms or Dover Junction, and succeeding the earlier one now under notice.

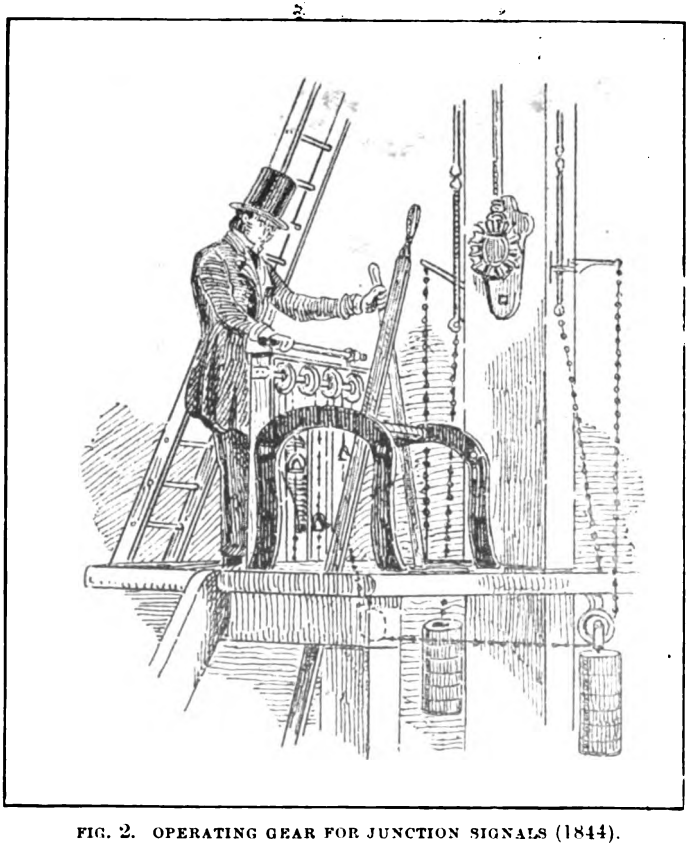

FIG. 2. OPERATING GEAR FOR JUNCTION SIGNALS (1844).

Fig. 1 is a reproduction of a wood-cut published at the close of the year 1844, depicting "the Junction Signal station at the point of union between the Croydon line and the Bricklayers' Arms branch of the Dover, near New Cross." The semaphores to the left controlled, in each direction, the Bricklayers' Arms traffic, the station known by that

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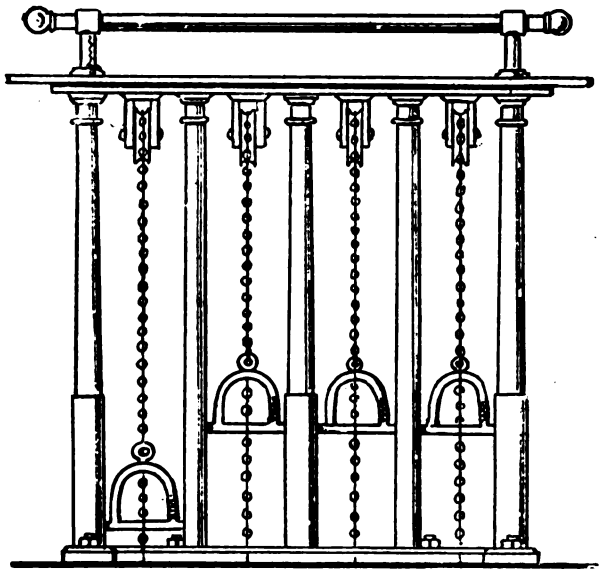

Fig. 3.

"STIRRUP" SIGNAL-FRAME.

name, being, at the time, the West End passenger terminus of the South Eastern, or Dover Railway. The signals to the right applied, as will be noted, to the London Bridge trains. Fig. 2 is a fac-simile of an accompanying engraving which represents, on a larger scale, the general mechanism. The policeman will be observed in the act of pulling the lever actuating the facing-points, while, with the left foot, he depresses the stirrup controlling the semaphore arm. Fig. 3 is an elevational view of the stirrup frame then employed, and as afterwards at junctions elsewhere. In this example the point levers will be noted in advance of the signal stirrups, the arrangement being thus contrived in order that the signalman might be enabled at the same time to operate both semaphores and points. The locking-gear eventually fitted by Mr. Gregory is not represented, otherwise the arrangement is typical of the period. The methods at this time adopted at Dover Junction may best be described in the actual words of the letterpress which accompany the original woodcuts:—"On a train, or engine, approaching any junction, the engineman holds out his hand by day, or a white light by night, to the right, or left, of his engine, to point out to the switchman the direction in which the train, or engine, is to be passed."

It may be interesting to recall the engine head code employed at the time, which the same writer supplies by a quotation from the current regulations, as follows:—"TRAIN SIGNALS.—Each train, after sunset or in foggy weather, is provided with White Engine and Red Tail Lights. The Brighton trains carry Two White Lights on the engine buffer-beam. The Croydon trains, One White Light on the top of the smoke box, and the Dover trains, One White Light on the buffer-beam, and one on the top of the smoke box. Every train carries Two Tail Lights placed horizontally. A Red Tail Board by day, or a Third Red Tail Light by night, indicates that a special, or extra train, will follow. Express engines or trains, which have the preference of all others, carry a White Board in front by day, and Three White Lights in front by night. The tremulous sound of the whistle is the signal for the guards to put on their breaks." The original, and indeed correct, spelling of the concluding substantive will be here noted. In the back-ground of Fig. 1 may be observed a wooden viaduct crossing the Grand Surrey Canal and the position of the train indicated marks the spot upon which the locomotive "Forester" exploded in December, 1844,

FIG. 4. "FIRST CLASS PASSENGERS."

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occasioning the death of the fireman. Mr. Bury, of the firm of Bury, Curtis and Kennedy, the makers of the engine, deposed that "he could only account for the explosion by the excessive pressure of the steam, and that most decidedly there would not have been an explosion had the safety-valve been open—that is, had there been sufficient water in the tubes." Mr. Cubitt, it may be added, was at this time Locomotive Engineer to the Dover Railway, while the above-mentioned Mr. C. H. Gregory (afterwards Sir C. H. Gregory) held the similar appointment upon the Croydon Line. The great diversity in design, or pattern, which characterised the signals of the various railways during the "forties," and long beyond, has already been noted in these pages. It may, therefore, be well to recall, in that connection, some remarks thereupon, proving strangely prophetic, which accompany the two engravings of "Dover Junction" above referred to. "Most of the lines," the writer says, "have systems peculiar to themselves; and in consequence, no uniform observance prevails between them, which is a practice much to be regretted, as it tends to confuse the observation of men engaged on different lines, and of engineers who change from one service to another. It cannot, however, be expected that so complicated an operation, and one, too, which has grown up under the management of independent companies,

FIG. 5. "TRAIN PASSING."

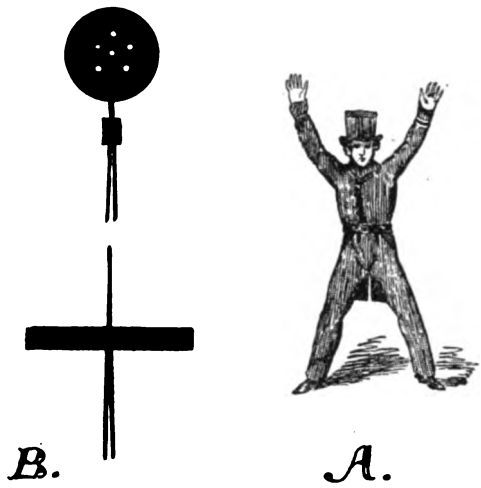

FIG. 6. OLD TIME SIGNALLING.

should speedily reach perfection. For the present, the signals are necessarily different on different lines; but we hope to see the day when the set which experience has proved the best shall be universally and compulsorily adopted." The writer next proceeds to describe "an entirely new set of signals recently introduced upon the Brighton, Croydon, and Dover Railways," in reference to the semaphore type, which the reader may recollect, was first employed by Mr. Gregory, of the Croydon Line.

Fig 4. reproduces a wood-cut of December, 1844, depicting the occupants of the first-class compartment of the period. Commenting upon the unsociability then (and perhaps even now) characteristic of railway travelling in this country, the writer adds:—"There is, consequently, no conversation. The heads of the four corner occupants are usually looking out of the windows, and the centre ones looking at each other. By the same rule, however, that you rarely see a pretty woman in an omnibus, so you scarcely meet with ordinary ones in a first-class carriage. Look at the group opposite to us. The old gentleman in the centre is deeply absorbed, looking neither to the right or left; the young soldier finds, most unaccountably, that the view from the window on the other side is far more attractive than on his own, and consequently keeps his gaze fixed in that direction, and the young lady must be putting mesmeric influence into action, and reading with her fingers, for her eyes are anywhere but on the page, and she has not turned over a leaf for five minutes: what can she be thinking about?"

A fac-simile of an engraving of corresponding

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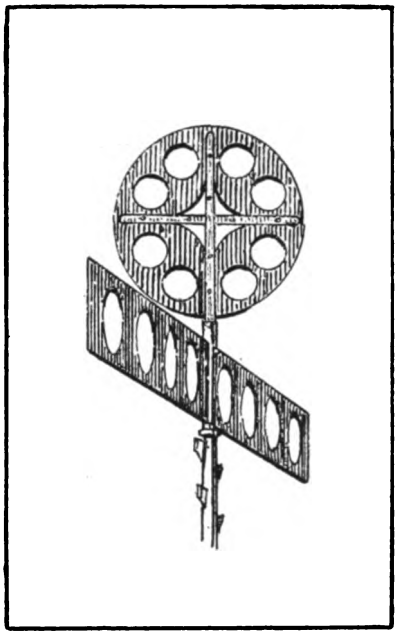

FIG. 7. STATION SIGNAL "ALL RIGHT" (1844).

date is supplied by Fig. 5, entitled "Train Passing," and applicable, in this case, to the second-class carriages of that day.

The afore-mentioned writer's comments thereon run thus :— "Ten to one, but in the second-class carriages you will find 'the old lady.' We particularise her thus, for she is nearly always there. You first find her in great distress about her box—which is a box unlike any ever seen before—at the omnibus. Then it is a source of the deepest trouble when she arrives at the terminus, because it will not go into any locker, or under any seat; and is finally put in a remote van, where the old lady would like to go too, if she were not nervous. Her ideas of train-power are limited, she looks upon the engine as something between clock-work and gunpowder, which keeps her in perpetual dread; and gives herself up for lost from the moment she starts until arrival, more especially when a train passes. The agony of the old lady, when she meets another train, is something terrible to see, and some time elapses before she can be persuaded that a dreadful accident has not happened, and everybody is crushed. But she becomes somewhat tranquillised by the time she reaches the next station; and at every stoppage enquires of the local policeman and attendant time-keeper if her box is safe—they knowing nothing in the world about it—or looks sharply after every passenger who gets out for fear he, or she, should walk off with it."

Fig. 6 is a fac-simile of wood-cuts contained in the "Instructions to Policemen, and Others, for the Management and Method of giving Signals," as issued by the Great Western Railway Company in February, 1841. "A" appears under the Caption of "Line Signals," the words of the accompanying instruction running thus :—"The *danger* signal to 'stop,' is shown by the policeman facing the approaching train, and holding both arms straight up as high as he can." The leather crown, which surmounted the tall hat of the period, is traceable upon the wood-cut, while the old-time "dress-coat," as then Officially described, will be likewise observed. In addition to the belt, the constable's staff formed a part of the regular equipment. A subsequent Book of General Instructions, in force during the year 1858, specify the following articles of clothing thus—

"Police. 1 great-coat and 1 cape every two years; and 1 dress-coat, 2 pairs of trousers, 2 pairs of boots, 1 stock, and 1 hat yearly." "B" represents the recently introduced "station" signal of disc and cross-bar type, originally used for blocking *both* lines of rail. The Government Inspector (Lt.-Col. Sir Frederick Smith) in a Report dated June 1st, 1841, thus refers to it :—"There is placed

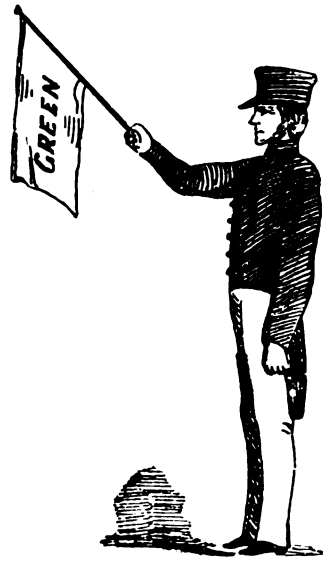

FIG. 8. CAUTION SIGNAL, LANCASHIRE AND YORKSHIRE RAILWAY (1855).

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FIG. 9. "WAITING FOR THE TRAIN."

on a lofty pole a horizontal board, which on being turned full on the line shows a black bar. When this signal is exhibited no train or engine is allowed to approach the station. On the same pole, but on a higher level, a round disc is placed. This disc presents its *edge* up and down the line when the cross-bar is exhibited, and these signals denote that the station must not be entered; but when the disc is visible up and down the line, and the cross-bar turned on so as to present its edge, then it is understood that the station is open for any engine or train." It will thus be perceived that the old-time practice of blocking the adjoining line, whilst a train occupied the stations, obtained upon the Great Western Railway at this period.

Fig. 7 is a reproduction of a wood-cut engraving also published in 1844, being a general sketch of the station signal alluded to. In commenting upon the recent inauguration of this characteristic form of signal upon the Great Western Railway, Col. Smith adds to the above-mentioned Report the following remarks. "As these signals differ so essentially from those in use upon other lines, and appear so well calculated for the object in view, I have thought it right to bring them under your special notice. Thus the enginemen and guards have both a positive and negative signal for their guidance, the exhibition of the cross-bar, and the non-exhibition of the disc signifying that they are not to approach; and on the other hand, when the disc is visible and the cross-bar is not seen, the station is considered to be clear." Originally the corresponding lamps for night use were placed upon separate posts, whilst the remarkable black colouring already noted was ultimately exchanged for the generally usual red.

Fig. 8 reproduces a plate contained in the Lancashire and Yorkshire Railway Regulations of 1855, depicting the "caution" signal, the appended instruction being as follows: — "If it be necessary to proceed with caution, from another engine having passed on the same Line within Five minutes, he (the signalman) will elevate his Green Flag, thus—by *Day;* and show his Green Light by *Night.*" A modification of the original police uniform is here observable, albeit the dress-coat and high collar are retained. The tall hat is replaced by the head-gear indicated, while the belt is discarded.

"Waiting for the train" is the subject of the last illustration, the scene being laid at the London Bridge station, which the letterpress accompanying described as the "strikingly handsome quadruple terminus leading out of Tooley Street." . . . "We call this a quadruple terminus because it serves four railways—the Greenwich, the Dover, the Croydon, and the Brighton." Describing the busy scenes preceding the departure of the latter Company's train, the narrative continues:—"Carriages are revolving on the turnabouts, to be added to the train; luggage barrows are rumbling down the platform, and porters are burying themselves in the lockers, head first, like bees in bell-flowers; some passengers are arriving; others are waiting for those who have not done so. Right before us is a widow lady—she must be the grandmother—guarding a fine chubby little baby, seated on a hamper, and crowing at the train. He cannot be going to Brighton for health—his cheeks are bursting with it. The pretty girl in the polka mantle is conversing earnestly with the young gentleman whilst her valetudinarian papa is twaddling with one of the young hangers-on."

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BOSTON MANOR: ONE OF THE METROPOLITAN DISTRICT STATIONS WHICH THIS YEAR OBTAINED A FIRST PRIZE FOR HORTICULTURAL DECORATION.

Gardens on the District Railway.

IN the last issue of the RAILWAY MAGAZINE the results of the recent garden competition on the Metropolitan District Railway was briefly announced; and an illustration given, showing one of the platforms at Northfields, a station which secured a first prize. A view is reproduced above showing another first prize station, Boston Manor; and, having regard to the fact that the gardens at the stations and adjoining the Underground Railways of the Metropolis are rarely equalled, and perhaps not excelled on any line in the country, further particulars will, we are sure, be welcomed in many quarters. Infrequent travellers on the District Railway are apt to express surprise at the gardens which they see at odd and unexpected corners along the railway. Regular passengers know, however that, with a view to brighten the line generally, and to encourage habits of care and tidiness among the employés, the Directors two or three years ago instituted an annual competition for the best gardens. The sum of £37 was originally allotted as prizes. At the commencement of the year each of the competitors is allowed 5s. for the purchase of seeds or plants, and the necessary mould or material for edging is supplied by the company.

Already the results have been very gratifying, and bright gardens are to be seen at such places as a vacant space between the tunnel and the station at St. James' Park. The electric sub-station at South Kensington has been transformed into a villa, with hanging flowers and flower boxes, while the gardens at Northfields and Boston Manor, which lie at the back of the platforms, vie with any similar gardens in the kingdom. Even at Mansion House a fairly successful attempt has been made in a spare space recently occupied by a siding. At Whitechapel quite nice gardens are now in existence, and it is suggested that similar attempts might be made to brighten the East-end thoroughfares. The gardens at St. James' Park have been mentioned. Others in the tunnel area are at South Kensington and Cromwell curve. Outside there are many patches at Earl's Court and at nearly every other station at Putney Bridge, Ealing, Hounslow, and Harrow.

These competitions affect only the flower gardens, but employés are allowed to use strips of vacant land free of charge for kitchen garden purposes. The person undertaking cultivation in competition may expend of his own money any additional amount which he pleases, and is allowed to avail himself of the produce of the plot, but it is not permissible to grow vegetables, as the object is decorative. At the end of July a Committee of Directors, assisted by officers of the company, make an inspection of the plots of land under cultivation, and decide upon the awards. The prizes are not necessarily awarded to the stations having only the best gardens, but to those competitors who make most of the conditions which exist at their stations, the general cleanliness of the offices and waiting rooms, as well as orderliness and neatness of the station premises being taken into consideration.

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In view of the excellence of many of the gardens, the amount offered was this year increased from £37 to £42. In awarding the prizes attention was given to (*a*) the general condition of the garden; (*b*) difficulties associated with the position; (*c*) size of work undertaken; (*d*) scheme of arrangement; (*e*) choice of position as regards garden coming under the notice of passengers. The awards made are as follow:—

THREE 1ST PRIZES OF £5 EACH:—Inspector Fulwell, Northfields; Inspector Parker, Boston Manor; Ganger Brown, South Kensington.

THREE 2ND PRIZES OF £3 EACH:—Platelayer Phillips, St. James' Park; Platelayer Lock, West Kensington Incline; Inspector Holloway, Hounslow Barracks.

TWELVE 3RD PRIZES OF £1 EACH:—Motorman Firman, Walham Green; Inspector Stinton, Ealing Common; Ganger Andrews, South Ealing; Gatekeeper Wood, Lillie Bridge; Travelling Inspector Mitchell, Acton Town; Platelayer Withall, Acton Town; Platelayer Tyler, Acton Town; Sub-station Attendant Leathwood, Whitechapel; Sub-station Attendant Howard, South Kensington; Ganger Bull and Platelayer Fiander, Parsons Green; Inspector Wild, Walham Green; Plumber Ashe, North Ealing.

TWELVE 4TH PRIZES OF 10S. EACH:—Inspectors Goss and Hurford, West Kensington; Inspector Beeton, Hammersmith; Ashmore, Signal Dept., Acton Town; Inspectors Young and Dunbar, Earls Court; Webber, Contact Rail Dept., Earls Court; Platelayer Dixey, Earls Court; Pond, Signal Dept., Minories Junction; Platelayer Elkins, Cromwell Curve; Inspector Court, Chiswick Park; Pickard, Signal Dept., Acton Town; Booking Porter Andrews, South Acton; Ganger Rowley, Earls Court.

"T. O. T.," the little Train, Omnibus, Tram publication issued by the employés of the District Railway, takes just pride in these underground gardens, and says:—

"The easiest of all visions that man conjures up is the vision of a garden, perhaps because of all beautiful things it came first to his knowledge. So to give grace and beauty to the Underground there are gardens wherever the supply of sunshine suffices to induce a bloom. This is chiefly on the District Railway. Of all the labours men undertake, that in which they expend themselves for joy of the result is surely the most beautiful, and these Underground gardens are the expression of the energy and skill of those employed otherwise at prosaic and routine work, such as opening and shutting doors and gates, punching and collecting tickets and attending to the details that ensure a tidy and effective station. Those who spend the best, will achieve the best, whether it be money, or labour, or time, or ability. Because of this the Underground has its gardens, the creation of its workers, and surely their joy and pride, too, and not of them alone but of every passenger that travels on its road. They add that something extra which, if any man shall ask thee to go with him a mile, thou shalt go with him twain for the pleasure of it.

"Recognising all this, the Management wish to express their thanks for the results attained, and to express it thus publicly. Their share in the results is but small, a grant of some five shillings for seeds at the opening of the season, the soil and the edging to make up the beds, and, at the close of the season, a scheme of prizes for those gardens which are best kept, having regard to the favourableness or disadvantage of the situation. Although the number of prizes is limited, the rivalry of the stations and the depôts is of the friendliest, and it is found difficult to draw a hard line between success and failure to receive one, so that the prize list itself tends to be elastic.

"Glancing over the railway one notes the sub-station at South Kensington, gay with hanging baskets and window boxes, and the bright little patch at Whitechapel. At West Kensington there are beds of many hues; and again at Earls Court, in the bits of soil cut to waste by the engineers who built the line. Mansion House has contrived a nook at the end of a disused siding. St. James' Park has framed up another with snow-white stones. The desolation of Cromwell Curve has been relieved by an oasis. Out west, where space is more free, there are lavish displays that deserve a visit, as at Northfields and Boston Manor. The Embankments at Walham Green are a forest of hollyhocks and the delight of artists."

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The Modern Locomotives of the Great Western Railway.

By REGINALD H. COE.

Photo] [*E. D. Ashton.*

NO. 2910, *Lady of Shalott* ON DOWN BIRMINGHAM EXPRESS, PASSING BICESTER.

IN the early days of railways, the Great Western was famous for its magnificent broad gauge engines, but when the narrow gauge triumphed, the line fell somewhat from its high position, and for some time the train services generally were of a mediocre character. Then, towards the close of the last century, came the awakening, and improvements were seen in the design and construction of the engines. Much needed advances were also made in the coaching stock, combined with better services and a complete "speeding-up" all round. This "renovation" of the line, as it might be termed, was not, however, a sudden revival, doomed to end equally suddenly. The changes in the Company's prospects were well maintained and when one innovation after another had been witnessed, the system reached the fine state of efficiency seen to-day, when the Great Western are running some of the fastest trains in the world, and holding the record for long-distance non-stop journeys, their "Cornish Riviera Express," which covers the 225¾ miles from Paddington to Plymouth in 4 hours 7 min., not being anywhere excelled.

Great Western locomotive practice is indeed unique in many respects. This has been the only line to adopt the taper boiler as standard, and the only line upon which modern outside-framed engines can be seen in such large numbers. Other noticeable features are the absence of domes on modern engines; and the general use of the Swindon superheater of the now characteristic top feed arrangement. The chief types of present-day Great Western locomotives may be briefly reviewed.

PASSENGER TENDER LOCOMOTIVES:—2-4-0 TYPE.

The oldest type of passenger engine at work is the 2–4–0, of which there are still a good number. They may be divided into two classes — single-framed and double-framed, the former having by far the more pleasing appearance. Both classes have rendered good service in their time, although they are now outclassed for fast main line purposes. They are to be seen on light semi-fast trains, and are useful for local and suburban traffic. The 2–4–0's have been built at various times, the last lot (the 3201 and 3501 batches) making their appearance in the "nineties." Some are very old, particularly Nos. 71–6 which were built in 1855, as single-wheelers, and converted to coupled engines about 1895. These (and No. 152 *Chancellor*) are the only 2–4–0's bearing names, which are respectively, *Dee*, *Exe*, *Isis*, *Stour*, *Teign* and *Wye*. The complete number running are: 19, 20, 27, 28, 30, 54–6, 71–6, 106–10, 112–4, 149-56, 191–201, 210–4, 372–7, 439–44, 481–90, 587–92, 717–26, 806–25, 1004–11, 2201–2220, 3201–3251 and 3501–3526.

THE "SINGLE-WHEELERS."

The "single-wheelers," once the pride of the Great Western, are now a terribly depleted family. More than half of the 80 superb bogie "singles" are no more, and of the erstwhile popular "Cobham" 2–2–2's, only 3 remain. It is more than probable that the "single" will soon be a thing of the past, so far as the Great Western are concerned. Some good work between London and Oxford and Worcester is still done by these engines, a number of the Paddington to Worcester expresses being fairly heavy and sharply timed. All that are now left of the 4–2–2 class, bear the following numbers and names:—

No.	NAME.
3006	*Courier*
3009	*Flying Dutchman*
3013	*Great Britain*
3018	*Glenside*
3027	*Worcester*
3032	*Agamemnon*
3039	*Dreadnought*
3041	*James Mason*
3043	*Hercules*
3045	*Hirondelle*
3047	*Lorna Doone*

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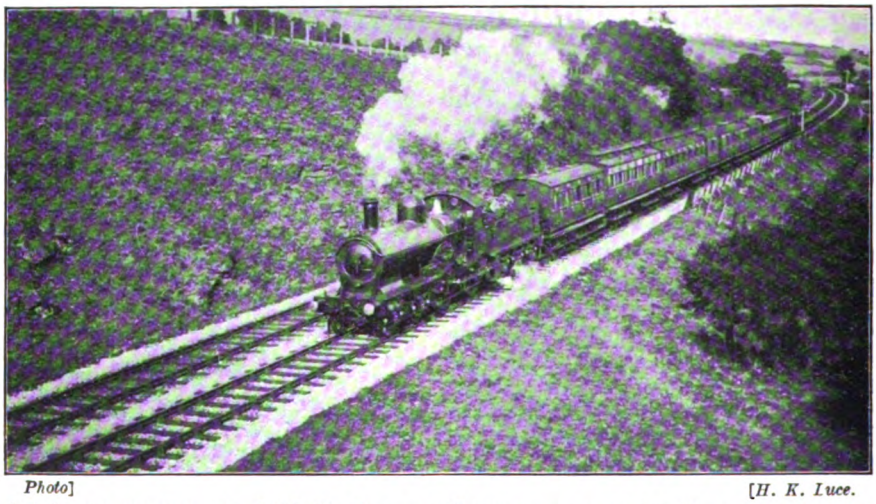
No.	Name.
3048	*Majestic*
3049	*Nelson*
3050	*Royal Sovereign*
3055	*Lambert*
3056	*Wilkinson*
3059	*John G. Griffiths*
3060	*John W. Wilson*
3061	*George A. Wills*
3062	*Albert Edward*
3064	*Duke of Connaught*
3066	*Duchess of Albany*
3067	,, ,, *Teck*
3070	*Earl of Warwick*
3071	*Emlyn*
3074	*Princess Helena*
3075	,, *May*
3080	*Windsor Castle*

The 4–4–0 Type.

As is the case on all our leading lines, four-coupled bogie engines are very numerous on the Great Western, and few railways can show so wide a variety of designs, though much has been done of late to standardise and bring into line all the 4–4–0's. The first of the class, *Duke of Cornwall*, was built in 1895, and the type which was introduced for use on the heavy gradients in Devon and Cornwall, was quickly multiplied. These had 5 ft. 8 in. coupled wheels and were followed by the "Badmintons" with 6 ft. 8 in. wheels. Then came further united-traffic classes, including the "Cotswolds," "Avalons," "Camels," "Cardiff" and "Birds," with the "Atbaras," "Cities" and "Flowers" of the 6 ft. 8 in. variety. Many of the earlier engines have been rebuilt to correspond with later designs. The "Counties" differ from all other classes in that they have outside cylinders and inside frames. Of the "Counties" there are now 40 altogether (Nos. 3800–3839) thirty bearing the names of English shires and the remainder the names of Irish counties. Under the recent re-numbering scheme (according to boiler power) the 4–4–0 locomotives are now divided as follows:—Unrebuilt, "Duke of Cornwall" and "Cotswold" classes—Nos. 3252–91; re-built, ditto. 3300–19; "Avalon" class, 3320–60; "Camels" (including old 3701 class), 3361–3455; "Atbaras" (with larger boilers), 3700–9; "Cities," 3710–9; "Badmintons," 4100–19; remaining "Atbaras," 4120–48; "Flowers," 4149–68. Rebuilt 4–4–0's: Nos. 7, 8, 14, 16, retain their original number. Altogether there are over 300 4–4–0 engines running; all except the 40 with outside cylinders, being of the double-framed construction. These various classes are rendering useful service all over the system, and they still have a good share of the main line work.



Photo] [*H. K. Luce.*

4–4–0 LOCOMOTIVE, NO. 3265 *St. Germans* ("DUKE OF CORNWALL" CLASS) ON LOCAL TRAIN, NEAR TEIGNMOUTH.

"Atlantic" 4–4–2 Type.

Of the "Atlantic" or 4–4–2 type, there are now only three running, these being the imported French De Glehn compounds (namely, 102 *La France*, 103 *President*, and 104 *Alliance*). All the Swindon-built "Atlantics" (originally about 15 in number) have been converted to the 4–6–0 type. Two of the remaining "Atlantics" (Nos. 103–4) are stabled at Old Oak, and the third

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is in Wolverhampton, the three taking turns with the large 4–4–0's and 4–6–0's on the "big" trains.

The 4–6–0 Type.

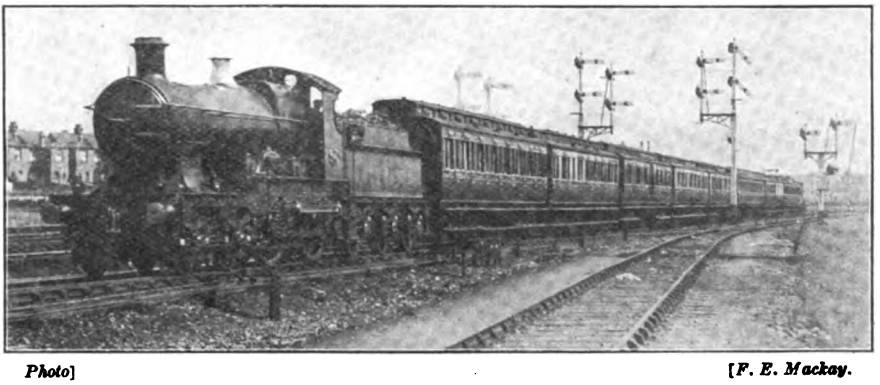
We now come to the principal type of engine running on the Great Western Railway—the six-coupled bogie locomotive, which has done much to establish the fame of its owners. Many writers have dubbed the Great Western a "six-coupled" line, and it certainly deserves the appellation, seeing that there is no other railway in this country which makes such an extensive use of the 4–6–0 engine for fast work. For instance, all the "crack fliers," beside a large number of trains of less importance, are daily hauled by "six-coupleds," and even on such a journey as that from Paddington to Birmingham, where the gradients met with are comparatively speaking, easy, 4–6–0's are almost invariably used. This is a striking contrast to the rival route—the North Western—where four-coupled engines reign supreme.

There are two classes of 4–6–0 engines, namely, two-cylinder and four-cylinder, but both are very similar in appearance, and in each case, the driving wheels are the same—6 ft. 8 in. in diameter. There are nearly 100 of the former and over 50 of the latter. All are "simple" engines, the only compounds running on the Great Western Railway being the afore-mentioned French "Atlantics." The first engines of the 4–6–0 type were Nos. 98 and 100, which made their appearance in 1903. Since then the type has been steadily multiplied.

All the "two-cylinders" are now numbered in the 29's, and the four-cylinders in the 40's. Of the latter class *Queen Mary*, the present "Royal" engine, has made numerous trips with Royal specials. Previous to her appearance *King Edward* did all the "Royal" work, and its last journey with Royalty was when it hauled the remains of King Edward from Paddington to Windsor, in 1910. *Dog Star*, a favourite 4–6–0, attained notoriety by running the 8.45 p.m. Night Irish Mail nearly every night for a considerable period. The first six-coupled engines to work through to Birmingham and the North were a number of the "Ladies," and *Lady of the Lake* took the first two-hour express from Snow Hill to Paddington.

I append a complete list of the 4–6–0 engines and their individual sheds :—

No.	Name.	At Present Stationed at
2900	*William Dean*	Bristol
2901	*Lady Superior*	Wolverhampton
2902	*Lady of the Lake* ..	Wolverhampton
2903	,, ,, *Lyons*	,,
2904	,, *Godiva*	Gloucester
2905	,, *Macbeth*	Wolverhampton
2906	,, *of Lynn*	,,
2907	,, *Disdain*	Gloucester
2908	,, *of Quality*	Wolverhampton
2909	,, ,, *Provence* ..	,,
2910	,, ,, *Shallot*	,,
2911	*Saint Agatha*	,,
2912	,, *Ambrose*	Paddington
2913	,, *Andrew*	,,
2914	,, *Augustine*	,,
2915	,, *Bartholomew* ..	,,
2916	,, *Benedict*	,,
2917	,, *Bernard*	Exeter
2918	,, *Catherine*	Paddington
2919	,, *Cuthbert*	,,
2920	,, *David*	Cardiff
2921	,, *Dunston*	Bristol
2922	,, *Gabriel*	Newton Abbot
2923	,, *George*	,, ,,
2924	,, *Helena*	Paddington
2925	,, *Martin*	Plymouth
2926	,, *Nicholas*	Cardiff
2927	,, *Patrick*	,,
2928	,, *Sebastian*	Fishguard



Photo] [*F. E. Mackay.*

NO. 3388 *Sir Redvers* ("ATBARA" CLASS REBUILT), ON DOWN WORCESTER EXPRESS.

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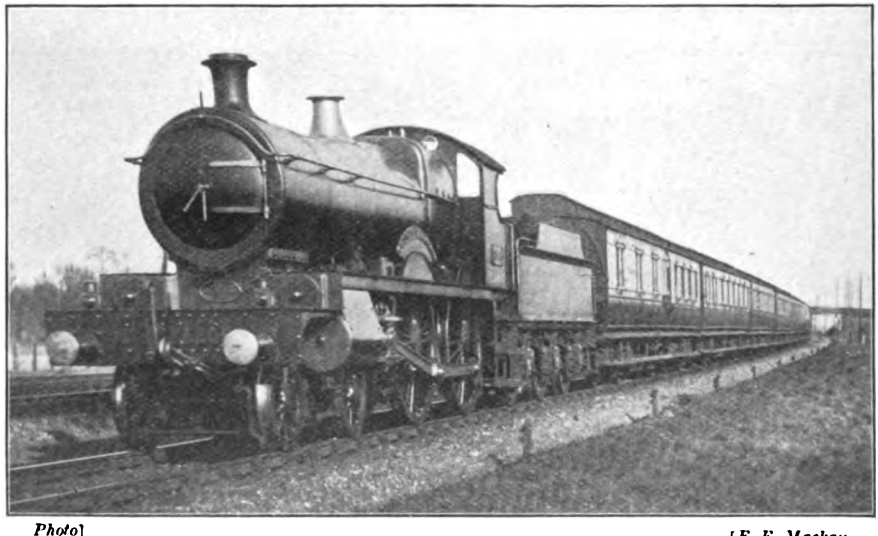
No.	Name.	At Present Stationed at
2929	*Saint Stephen*	Cardiff
2930	,, *Vincent*	Bristol
2931	*Arlington Court* ..	Exeter
2932	*Ashton* ,, ..	,,
2933	*Bibury* ,, ..	,,
2934	*Butleigh* ,, ..	Plymouth
2935	*Caynham* ,, ..	,,
2936	*Cefntilla* ,, ..	Cardiff
2937	*Clevedon* ,, ..	Fishguard
2938	*Corsham* ,, ..	,,
2939	*Croome* ,, ..	Exeter
2940	*Dorney* ,, ..	Fishguard
2941	*Easton* ,, ..	Paddington
2942	*Fawley* ,, ..	,,
2943	*Hampton* ,, ..	Plymouth
2944	*Highnam* ,, ..	Paddington
2945	*Hillingdon* ,, ..	Bristol
2946	*Langford* ,, ..	,,
2947	*Madresfield* ,, ..	Paddington
2948	*Stackpole* ,, ..	Cardiff

No.	Name.	At Present Stationed at
2981	*Ivanhoe*	Bristol
2982	*Lalla Rookh*	,,
2983	*Red Gauntlet*	,,
2984	*Guy Mannering*	,,
2985	*Peveril of the Peak* ..	,,
2986	*Robin Hood*	,,
2987	*Bride of Lammermoor* ..	,,
2988	*Rob Roy*	,,
2989	*Talisman*	,,
2990	*Waverley*	,,
2998	*Ernest Cunard*	Gloucester
	Four-Cylinder Class.	
4000	*North Star*	Paddington
4001	*Dog* ,, ...	Cardiff
4002	*Evening Star*	Paddington
4003	*Lode* ,, ...	,,
4004	*Morning* ,, ...	Wolverhampton
4005	*Polar* ,, ...	Paddington
4006	*Red* ,, ...	,,



Photo] [*F. E. Mackay.*

NO. 3806 *County Kildare*, ON SOUTH WALES EXPRESS.

2949	*Stanford Court* ..	Wolverhampton
2950	*Taplow* ,, ..	Paddington
2951	*Tawstock* ,, ..	Cardiff
2952	*Twineham* ,, ..	,,
2953	*Titley* ,, ..	Bristol
2954	*Tockenham* ,, ..	Newton Abbot
2955	*Tortworth* ,, ..	,, ,,
2956		
2957		
2958	At present under construction.	
2959		
2960		
2961–70	At present blanks.	
2971	*Albion*	Bristol
2972	*The Abbot*	Gloucester
2973	*Robins Bolitho*	Cardiff
2974	*Lord Barrymore*	Bristol
2975	*Viscount Churchill* ..	Newton Abbot
2976	*Winterstoke*	,, ,,
2977	*Robertson*	Paddington
2978	*Kirkland*	,,
2979	*Quentin Durward*	Newton Abbot
2980	*Cœur-de-Lion*	Gloucester

4007	*Rising Star*	Paddington
4008	*Royal* ,, ...	Cardiff
4009	*Shooting* ,, ...	Plymouth
4010	*Western* ,, ...	,,
4011	*Knight of the Garter* ..	,,
4012	,, ,, ,, *Thistle* ..	Paddington
4013	,, ,, *St. Patrick* ..	,,
4014	,, ,, *the Bath* ..	Cardiff
4015	,, ,, *St. John* ..	Plymouth
4016	,, ,, *the Golden Fleece*	,,
4017	,, ,, ,, *Black Eagle*	Paddington
4018	,, ,, ,, *Grand Cross*	,,
4019	,, *Templar*	Cardiff
4020	,, *Commander* ..	Plymouth
4021	*King Edward*	Paddington
4022	,, *William*	,,
4023	,, *George*	,,
4024	,, *James*	,,
4025	,, *Charles*	,,
4026	,, *Richard*	Plymouth
4027	,, *Henry*	Paddington
4028	,, *John*	Plymouth
4029	,, *Stephen*	Paddington

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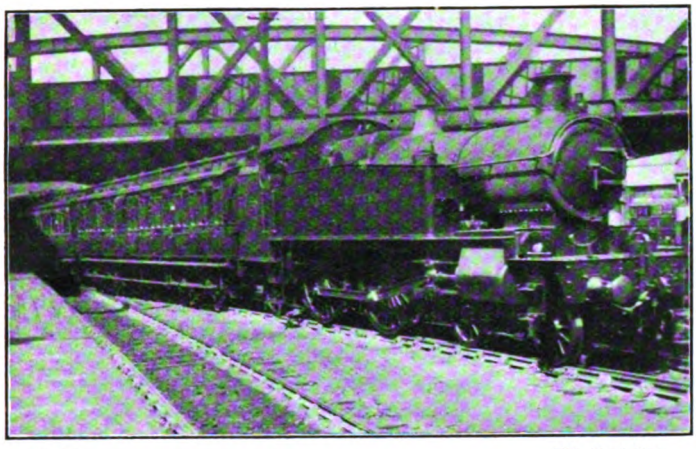

Photo] [*W. Partridge.*

4–4–2 "COUNTY" TANK ENGINE ON TRAIN OUTSIDE PADDINGTON STATION.

No.	Name.	At Present Stationed at
4030	*King Harold*	Paddington
4031	*Queen Mary*	,,
4032	,, *Alexandra* ..	Plymouth
4033	,, *Victoria*	Paddington
4034	,, *Adelaide*	Wolverhampton
4035	,, *Charlotte*	Paddington
4036	,, *Elizabeth*	Wolverhampton
4037	,, *Phillipa*	Plymouth
4038	,, *Berengaria* ..	,,
4039	,, *Matilda*	Paddington
4040	,, *Boadicea*	Plymouth
4041	*Prince of Wales*	,,
4042	,, *Albert*	Paddington
4043	,, *Henry*	,,
4044	,, *George*	,,
4045	,, *John*	,,

4–6–2 "Pacific" Type.

One type of express passenger locomotive remains to be dealt with—the "Pacific," or 4–6–2 class, of which there is only one running in this country. The representative of the type in question, *The Great Bear*, No. 111, made its appearance in 1908, and caused no small stir at the time. As the class has never been multiplied, many have assumed it to be a failure. This is by no means the fact, and the only reason of its scarcity is that it is unpopular in the engineering department. Owing to its immense size and weight, *The Great Bear* is restricted to one section of the line—that between London and Bristol—and it almost invariably takes the 6.40 p.m. (originally 6.35 p.m. Bristol express, with a first stop at Bath) returning with, in the night, a heavy mineral train.

Goods Tender Locomotives "Consolidation," or 2–8–0 Type.

The "Consolidation," or 2–8–0, mineral engine is not very common in this country, and is only to be found on three lines. The Great Western were the first to introduce it and so satisfactory was the working of the initial machine—No. 97 (now renumbered as 2800), that 55 more were subsequently built (Nos. 2801–55). They have very long boilers, and are remarkably powerful. Recently No. 2834 hauled a mineral train of 100 wagons (most of them loaded) from Banbury to London in record time.

"Mogul," or 2–6–0 Type.

There are over 100 2–6–0 "Mogul" engines in service, the most modern of which have outside cylinders and are used for mixed traffic purposes. This batch is numbered from 4301 onwards, and the older lot (which have outside frames, and are only used for heavy goods work) are numbered 2600–2680 inclusive. Before their introduction there were a few experimental engines, including No. 36, first 4–6–0 engine of any design used in England, though Mr. Jones' 4–6–0 goods engines in the Highland Railway were slightly earlier.

Photo] [*W. P. McGeoch.*

2–6–0 GOODS ENGINE WAITING FOR SIGNALS AT MALVERN WELLS.

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0–6–0 Goods Locomotives.

Six-coupled goods engines of various sizes and shapes are to be found in vast numbers on the Great Western Railway. The older engines are double-framed, but the more recent have only single-frames. When built, this latter lot numbered 2301–2580 inclusive, but 20 of them have since been converted into 2–6–2 tanks. Almost 800 of this class are running, and are to be found in every part of the system, where they always prove invaluable for goods and mixed traffic.

"Tank" Engines: 4–4–2 Tanks.

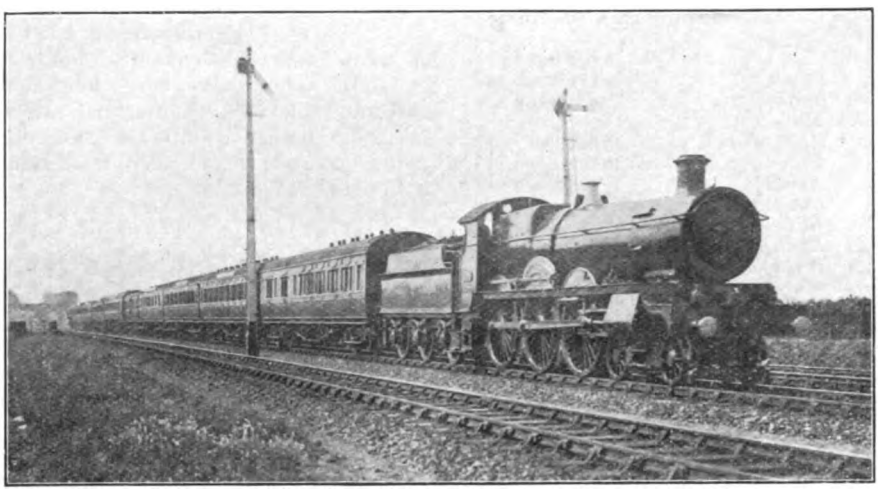
As is the case with the tender engines, the tank engines of the Great Western have reached a fine state of efficiency. The chief type is the 4–4–2, or "County" tank, which is largely used for express work. These locomotives number from 2221 to 2250, and principally work between Paddington, Reading, Swindon and Oxford. They present a very sturdy appearance, and often make good runs. Their official designation, "County" tanks, is derived from their close resemblance to the "County" 4–4–0 class, nearly all their dimensions being similar. With 6 ft. 8 in. driving wheels, they are capable of attaining a high rate of speed and are always to be relied upon.

2–8–0 "Consolidation" Tanks.

The Great Western is the only line—as far as the writer's knowledge serves him—possessing tank engines of the 2–8–0 wheel arrangement. There are 30 of this type running (bearing numbers 4201–30), and they are all stationed in the South Wales district, where they perform some very heavy work with the mineral trains.

2–6–2 "Mogul" Tanks.

A very useful class of tank locomotive is the 2–6–2 type, and it is not surprising to find there are considerably over 100 of them at work. There are really several distinct types, the variations being in the driving wheels. All except 20 have outside cylinders and are of modern construction. The exceptions in question are converted 0–6–0 goods engines, and are one of the finest examples of a complete conversion from one type to another. Most of them are running in the Midlands, where they do much useful work.



Photo] [*H. T. Worlock.*

NO. 2986, *Robin Hood* (FORMERLY 4–4–2 TYPE) ON UP CHELTENHAM AND GLOUCESTER EXPRESS.

2–4–2 Passenger Tanks.

This is a very useful class of engine for suburban and local work, and is also much used on short semi-fast runs. The first, was No. 11, subsequently renumbered 3600, the whole series now numbering from 3600 to 3630 inclusive. They are to be found in nearly all parts of the system, and are usually referred to as the "Camel" tanks. Not infrequently they are to be seen on goods trains, for which their small driving wheels are well adapted. Originally built with the old pattern round boilers, they have now all been rebuilt with taper boilers and present a very neat, yet powerful appearance.

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Small Passenger Tanks.

The smaller and older type of passenger tank, are of two designs, the great difference being in the wheels, one lot having the 2–4–0 wheel arrangement and a smaller number the 0–4–2. In other respects they are really similar, though their dates of construction vary somewhat, and the expert would notice small points in which various engines of the type differ. Many of the 2–4–0 tanks were built as far back as the "sixties," and are still doing good work, their labours being now chiefly centred on the country branches. On these lines the trains are not always so light as might be imagined. On the Henley-on-Thames branch, for instance, as many as 9 or 10 bogie coaches are often hauled. The latter branch affords, by the way, an excellent illustration of the work which the old passenger tanks have to undertake. They usually work seven days at a stretch, before being cleaned and overhauled. The last of this type to be constructed were a number turned out in the "nineties" for working on the underground. Originally this lot were minus cabs, but the majority now have this desirable appendage, now that the condensing apparatus has been removed. Many of the 0–4–2's have been converted into auto-car engines, and are painted brown to match the coaches.

0–6–0 Saddle Tanks.

An exceptionally large number of this useful class of shunting engine is to be found on the Great Western, and they are of all kinds and classes. Peculiar-looking squat saddles are a conspicuous feature with most of them, but recently Swindon has been busy rebuilding some with "pannier," or square, tanks over the boiler. Thus converted, they resemble very closely the square saddle tanks on the London and North Western Railway.

Miscellaneous Engines.

There still remain quite a number of types with which I have not dealt, but they are mostly odd engines of more or less startling appearance. Two are crane locomotives, numbered and named respectively—17, *Cyclops*; 18, *Stirrops*. The former works at Wolverhampton, the latter at Swindon. They have six-coupled wheels. Several of the old 0–6–0 Metropolitan side tanks are still at work, in the London district, where they are chiefly used for hauling goods trains over the Metropolitan Railway to Smithfield goods depôt.

Visitors to Aberystwyth may have noticed a rather curious engine, bearing evidence of a Crewe birth, but with the marks of Swindon's hand upon it. To be precise, this is an old North Western coal engine (designed by the late Mr. F. W. Webb), but it now boasts a Great Western tender, smoke-box door, and is painted green instead of black. It bears the No. 1338, and was taken over with the stock of the old Manchester and Milford Railway.

This concludes the brief *resumé* of the Great Western Railway's principal locomotives, and if the writer has not dealt with the subject so fully as it deserves, he can only plead lack of space as his excuse. Great Western locomotive performance calls forth the admiration not only of railway enthusiasts, but of the public generally, as is proved by the number of people who are invariably to be seen watching the "crack" expresses leaving or arriving at Paddington or any other of the numerous large stations on the line. The company have every reason to be proud of their locomotive superintendant—Mr. G. J. Churchward—who is admitted on all hands to be one of the ablest engineers of the day. His predecessor, the late Mr. William Dean, was also an exceedingly clever man. Indeed, looking back through the history of this great undertaking, one is struck by the names of the famous men who have been associated with its enterprises—truly a record of which all may boast.

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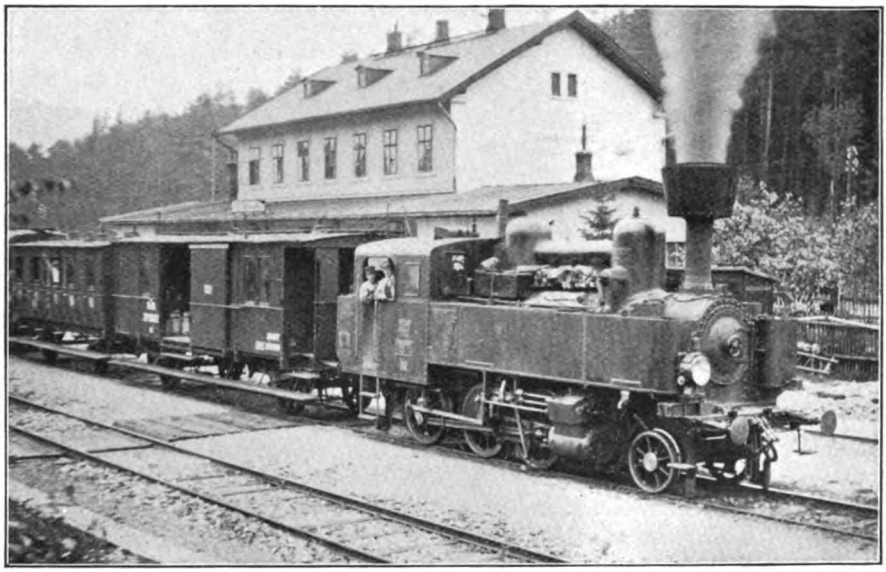

Photo] [*Capt. F. S. Watson.*

2-6-0 TANK ENGINE, AUSTRIAN STATE RAILWAYS, ON LOCAL TRAIN AT AICH-KIRKENHAMMER STATION, ON THE KARLSBAD–MARIENBAD BRANCH.

Leaves from the Log of a Locomotive Engineer [No. XII.].

By ROBERT WEATHERBURN.

EVEN with the presence of a surveillance and stern police rule that would almost claim to be ubiquitous, with the assistance of those subsidised bodies, Isvostchiks and Dworniks, it would be difficult to find more lawless men than can be met with on the outskirts and in the purlieus of large Russian towns and cities. Crime is very rife, and this may be due in the first place to the inherent dishonesty that prevails, and to the laxity of several of those moral laws which when infracted lead one knows not where. The indifference to human life and suffering is painfully evident, and whenever such is the case little sanctity is attached to other human affairs. For centuries the Russian has been brutalised, and when the depraved instincts get the upper hand, he feels no compunction in using the knife or the bludgeon to carry out his purpose.

I remember one episode which fortunately turned out much better than I merited. Having to leave Riga for Revel in a great hurry, I booked as far as possible, at that time that is from Riga to Gatchina, and on my arrival somewhat late at night, was informed that I should have to travel some versts by sledge in order to reach the nearest station on the Revel line, and, so far as the Buffetchik knew, there was no train until early in the morning. I therefore made myself comfortable in a warm part of the room, and had a hearty meal, after which I asked the Buffetchik to get me a sledge to convey myself and luggage to the Gatchina Revel station, making all necessary enquiries, as I thought, to that end. Until months later I was not aware that these sledges were neither registered nor even known in many instances. When, at last, a greasy, disreputable specimen of a driver, with a leering face that would have suited admirably for a grotesquely hideous gargoyle, came up, and proffered his services, I was explaining to the Buffetchik that his bill of two roubles twenty-five copecs could not be paid unless

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he changed me a hundred rouble note, of which I was taking one off of a number I had rolled up which I kept for safety in my breast pocket.

The hundred rouble note is probably the handsomest paper money in Europe both in colour and design, and as I handed him the note and turned round I was impressed by the hungry, thievish look which mantled the face of the waiting driver. I made the bargain for two roubles fifty copecs, with fifty copecs extra for quick work. Banishing all apprehension, I pocketed the change which the landlord had brought, and announced my readiness to go. Here the kutcher verbosely explained that in order to do justice to me, he proposed to change his horses for better ones, and for that purpose would not be longer away than ten minutes. It was somewhat longer than that time when he returned, and at once shouldered my luggage and placed it in the sledge. When I was properly seated he dashed off at a good speed through the dreary and dark-looking streets of Gatchina. We were soon free of them, and where few houses were to be seen, when I was annoyed but not surprised at the sledge drawing up in front of a low looking Kabak or public-house, and being asked to "stand him a drink."

Not knowing the route, and thinking it better to humour him, I sprang out and walked through the low doorway, and found myself amidst a group of evil-looking and bad-smelling fellows who were drinking wodka. I called for wodka for the driver and myself, keeping as close to the door as possible in case of an attack. Hurriedly I drank off, and insisted on the driver doing the same, although the company protested at my unreasonableness. After some vexatious delay and threatening my man, he reluctantly and slowly drove on. Knowing that we had plenty of time, I did not care so much. After some time, I noticed that we were passing through a sunken way with very large buildings on the left, which the driver explained were barracks for soldiers. The hour was late—about 11 p.m. —and it is very seldom indeed that any pedestrian or vehicle can be seen abroad in villages, hamlets or small towns at that hour in winter.

We were nearly through the cutting or what appeared to be escarped banks, still with large, dull, unlighted buildings looming behind on the left, and what seemed to be a forest on the right, when I saw two men rushing down the right bank ahead to block our way, and at once the driver without demur or interrogation pulled up his horses. I had previously been somewhat uneasy at the dismal looking way we had entered upon, more particularly as the driver had occasionally hinted at the neighbourhood being infested with Caramanjiks (robbers and murderers), prowling soldiers who he unhesitatingly considered the worst. I had pieced together the changing of horses and the ten minutes' absence with the low Kabak and its villainous crew, the slow after ride, and what appeared to me to be a roundabout way and a loss of time, besides which the driver, although his sledge was admirably horsed, persisted in loitering and talking on the way. However, here we were pulled up, and on a nearer approach showed them to be soldiers with their side arms, which I knew they would use infamously if required.

I ordered the driver to proceed, and threatened him with all the known penalties and loss of fare if he stopped longer. But not one inch would he budge, and the first soldier was near at hand. On the instant I had resolved on doing my best, and warned the soldiers to stand clear, demanding what their business was in stopping my way. Something was said by one to the other in so low a tone that I could not hear its meaning, when the nearest one, with that subtle persuasive voice which none other but the true Hibernian can hope to equal, asked me for a light for his pipe. My hand was gripping the revolver in my coat pocket all the time; on his approaching nearer without pipe, I drew it forth and thrust it close to his face. "Posmatrivat revolver soldat," I shouted, when, with a spring, he withdrew a couple of yards. To show them I was in earnest, I fired one shot into the snow, and the ominous click of the self-cocking was heard as I swore (and I meant it) that I would shoot the first man who approached, for I could see murder and pillage in their looks.

Fortunately both men remained on my right. I rose indignantly to my feet, and drove my left fist into the back of the neck of the driver, nearly dislocating it, and swore that unless he immediately drove on, I would give him a shot in the back. Another blow forced him into action, and he drove on, protesting, while I kept the revolver pointed at first one then the other as they tried their best to dodge round. I felt very much relieved when we at last emerged from the narrow way, and had an open *terrain* before

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us where I could see on every hand. I had far from recovered my composure when we drove up to the station, a wooden structure standing most forlorn, and my apprehensions increased when I could discern neither light nor lamp of any kind, either in the buildings or the windows, to indicate that it was inhabited. I sprang from the sledge and ran up the wooden steps. Turning my back to the door, I kicked with all my might with my heels, my heart beating anxiously the while, for if closed I must perforce drive back, and the hideous Caliban of a driver could take me in a wrong direction or lead me into still greater danger. I kicked again and again, and at last had made up my mind to drive back and face the peril, when I heard someone pottering about, on which I vigorously resumed kicking.

I heard the feet approach and the cross-bar removed from the door. In answer to a demand as to what I wanted, I hastily promised the fellow Natchi if he would let me in and wait there until the train was due. I further informed him that I had had bother with the Caramanjiks. I thrust a rouble note into his by no means reluctant hand, and consenting that I should remain, promised to find me a warm corner in the booking office. I returned to the sledge, and after having carried my luggage to the door, turned round to my Kutcher and proffered him three roubles. He demurred, and swore that I was indebted to him for my life, as his presence alone had saved me from the soldiers. At this I hardened my heart, and flung the three rouble note on the snow at his feet, and as he stooped to pick it up, gave him such a smack followed by a kick as he would never forget, and the recollection of which might be of service to others. Still howling his imprecations, I left him and went inside, where I found the Zwornik, somewhat afraid of having made a mistake after witnessing my treatment of the driver. But I re-assured him, and told my story as well as I could, and after giving him a good drink, he told me of several cases where travellers had been found ill-treated and dead between the two stations so wide apart, particularly one for whom he had two years previously worked at Petroff, who had been most barbarously done to death.

Mr. Weatherburn's next contribution will appear in the November issue of the "Railway Magazine."

Photo] [*H. E. Ambrose.*

LONDON AND NORTH WESTERN RAILWAY.

Down Liverpool, Manchester and Birkenhead Express.

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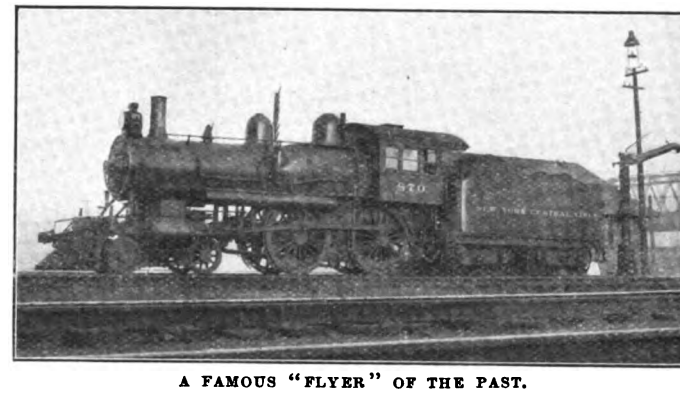
Recent American Locomotive Practice.

By W. G. LANDON.



A FAMOUS "FLYER" OF THE PAST.
New York Central Locomotive, No. 870.

IN America, as many people know, the general practice is a simple engine with a wide firebox having a large grate area, a large boiler with a fire tube superheater, and piston valves actuated by the Walschaert or Baker gear. The 4–4–2 type is rapidly disappearing on some roads for fast passenger work. For instance, on the Hudson division (New York to Albany) of the New York Central main line there is only one express train hauled by a 4–4–2, and there are 225 engines of this type. A great number of them are worked on suburban trains weighing from 105 to 280 tons, but generally about 140 tons. This seems ridiculous, especially as their driving wheels are 79 in. and heating surface 3,400 sq. ft.

A suitably designed six-coupled tank engine should be employed, to get away with the train quickly, save the time of turning at each end of the run, and work economically, as is done in England. This railway had some 2–6–6 tanks which must have been unsuitably designed, for they were soon removed from the New York suburban service, and were converted into tender engines. Let me not, however, give the impression that the 4–4–2's are no longer able to work the ordinary American express trains, for I think it is safe to say that the 4–4–2's, if properly maintained, could handle with a good margin of reserve power many of the through trains on the New York Central, the exceptions being those which have a fast schedule with a load of 800 tons or more, and those which have a heavy load with many stops. Although the trains weigh up to 900 tons, the road is very level, and the schedules require only 35 to 40 miles per hour average. The reason the 4–4–2's are not used, however, is that it is customary on some railways here to have a locomotive of such dimensions that, if maintained in moderate condition, it will just about handle the train. There are engines, nevertheless, which haul trains of such weight and at such speed as to necessitate their being kept in the best shape. Trouble with the boiler makers in the past year accounts for the poor condition of some engines on the New York Central.

No. 3876 works the one Atlantic express train above mentioned. It was built in 1905. In October, 1912, it was equipped with a fire tube superheater, the Stephenson motion was removed and the Baker gear substituted. As this gear is unknown outside of America, a description may be of interest. Accompanying sketches show the arrangement with inside admission valves. The eccentric crank in any case follows the main crank at 90° or more if the *c* is above the horizontal line through the axle centre, when the piston is at either end of the stroke. The eccentric crank gives the valve its travel, whereas the crosshead connection gives the lead. From the sketches it will be seen that triangle *abd* oscillating on *a* as a fulcrum imparts movement to the bellcrank which is transmitted to the valve rod. When the lever is notched up toward the centre, *a* and *b* are brought closer together, reducing the swing of the bellcrank, and giving in connection with the combination lever, the cut off.

When the motion is reversed (Fig. 4), the triangle is inverted, so that *a* being on the other side of *b*, the bellcrank is caused to move in opposite directions for corresponding movements of *c*, from what it did when the lever was in forward position. Although the lead of this gear is constant, it advances, or, in other words, the valve uncovers the port at an earlier period as the lever is brought up to the centre. To show this, suppose the crank in Fig. 1 were backed a little off dead

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THE BAKER VALVE GEAR

as arranged for inside admission

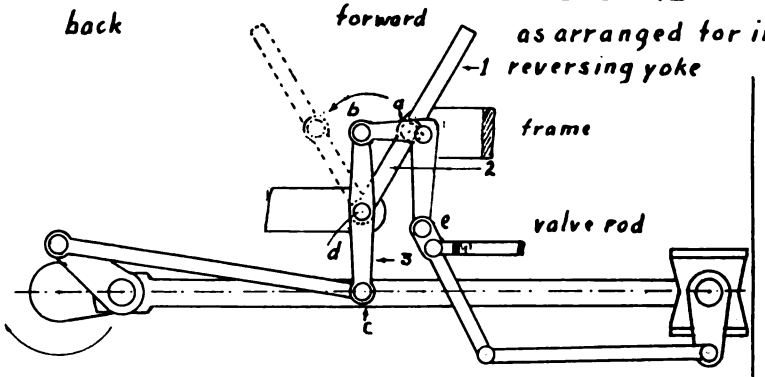

Fig 1 f and lower part of 1 hidden by 2

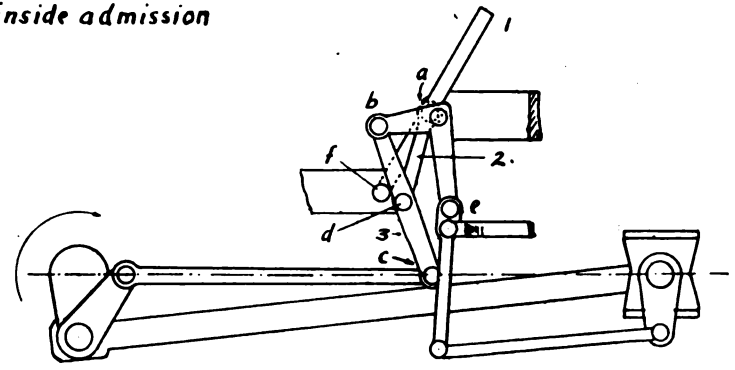

Fig 2

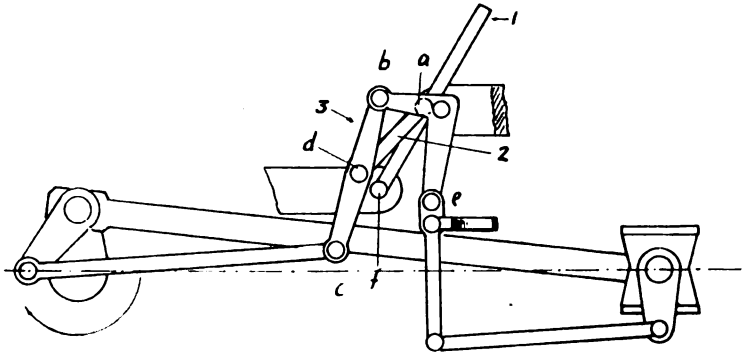

Fig 3

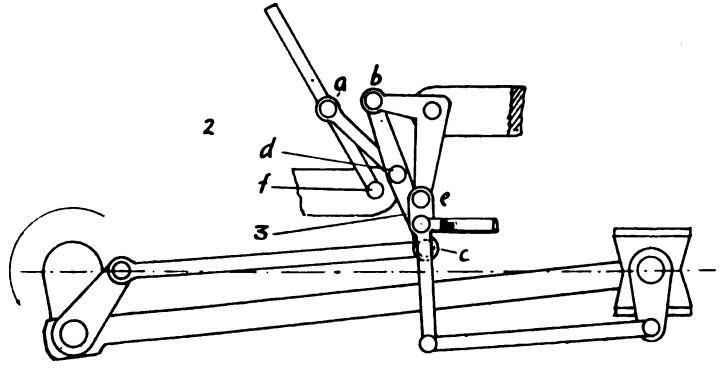

Fig 4 Gear reversed

W.F.Lander

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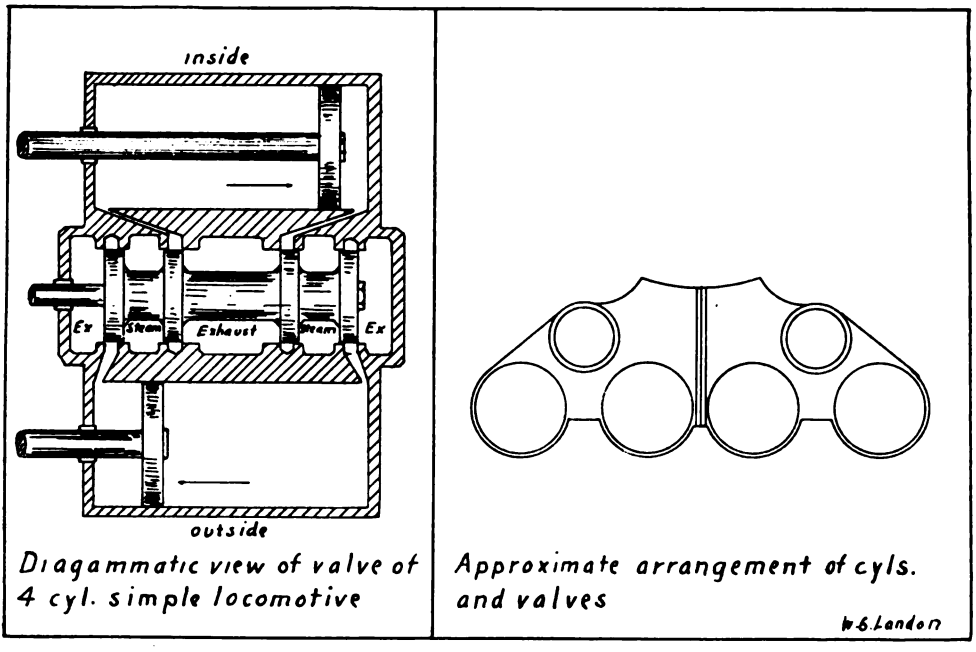
centre, an exaggerated amount being shown in Fig. 3. If now the lever be moved toward the centre from forward position, it will move the bellcrank, and hence the valve in the direction which, if continued, would open the forward port admitting steam to that end of the cylinder. Thus, when the piston is, say, ¾ in. from the end of its stroke, steam is actually admitted with a short cut-off, but not with a long one—in back gear likewise. This is practically the same as increasing lead on the Stephenson and, of course, is an advantage, especially in express engines. Other merits of this gear are its rapid action and the absence of links or sliding blocks. It appears, however, that wear might affect its accuracy more than that of the Walschaert gear. In practice many of the parts are made double pieces, arranged so that all the stresses come in a straight line. The valve rod is not so low as shown in the sketch, and it is hinged at the point where it is attached to the valve guide block. The eccentric rod is made long enough to obviate the inaccuracy caused by its angularity. With outside admission valves, the bellcrank faces forward, and the combination lever is extended beyond *e*, where the connection to the valve rod is made. Other things remain unchanged. The piston valves of 3876, having been arranged for direct connected Stephenson motion, it was necessary to provide rocking shafts to transmit the motion.

The 4–6–2 type are also numerous on the New York Central, there being up to the present 167. Principal dimensions of the latest are: cylinders 23½ by 26 in., driving wheels 79 in., heating surface 3,785 sq. ft. (all heating surfaces given are exclusive of superheater), superheater 705 sq. ft. These engines have the wheel reverse—a practice which is becoming quite common here. Their power is surprising, for, before the time between New York and Chicago was lengthened from 18 to 20 hours, the 135·1 miles from Albany to Highbridge, New York, where the change from steam to electricity is made, was frequently covered in the schedule time of 160 min., or 50·7 miles per hour, with nine steel sleeping cars and two steel dining cars, each of 75 tons weight, making 825 tons total. The road, however, has only three slight gradients, the rest being nearly dead level. But to offset this there are two speed reductions to 20 and one to 25 miles per hour, besides various irregular slow downs to 10 or so on account of the reconstruction (road being four-tracked and many curves being made of larger radius), and when the speed of an 825-ton train is reduced to such rates, it requires a long distance to accelerate again.



Diagammatic view of valve of 4 cyl. simple locomotive

Approximate arrangement of cyls. and valves

W.S. London

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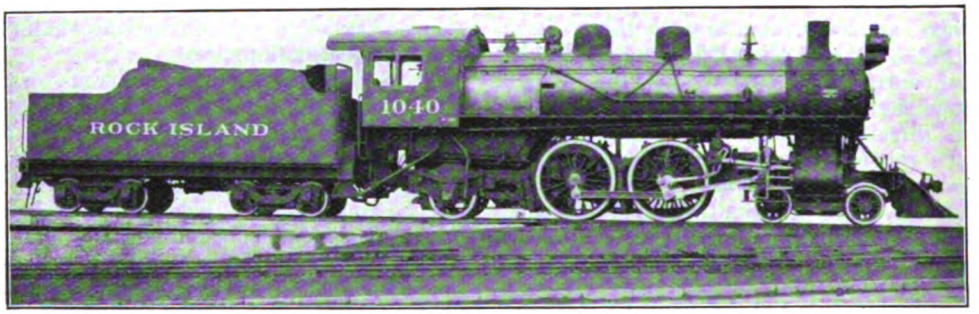
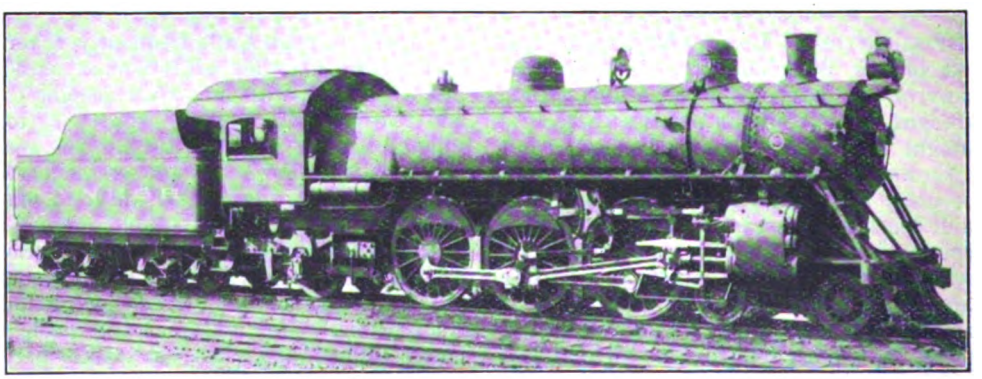


CHICAGO, ROCK ISLAND AND PACIFIC RAILWAY FOUR-CYLINDER SIMPLE LOCOMOTIVE.
Built by American Locomotive Company, New York.

On the New York Central there are about 70 4–6–2 goods locomotives—a rather unusual type for this service. The explanation, as the dimensions will show, is to have an engine which can make 40 miles per hour with a 2,000 tons load, and thus keep ahead of the average passenger train, thereby eliminating much side tracking. This is especially the case on the Hudson division, where there are at present only two tracks. Principal dimensions of these engines are: cylinders 26 by 26 in., driving wheels 69 in., heating surface 3,769 sq. ft., superheater 790 sq. ft. The driving wheels are probably the largest in the world for goods service. Before leaving the New York Central, I should mention the famous locomotive No. 870, a photograph of which is reproduced. This engine was built in 1889, and worked the Empire State Express from 1891 to 1901, making in that time 1,001,000 miles. In the record from New York to Buffalo this engine took the four-car train (175 tons) from New York to Albany, 143 miles, in 134 min. In 1903 it was transferred from the main line, and has since been running on branches. It has probably covered more than 2,000,000 miles to date. This record, I think, is equal to that of the *Charles Dickens*, when the fast schedule of the "Empire State Express" at that time is taken into consideration. Abroad the impression prevails that locomotives in this country are broken up after ten years of service. As a matter of fact, there are few engines which do not run 20 years or more unless destroyed by wreck.

The New York, New Haven and Hartford Railway has not any long non-stop runs, but it has more fast trains for short distances than any road in this country, and as few of its trains run over 240 miles, they are not often late. Its express engines are of the 4–6–0, 4–4–2 and 4–6–2 types, all of which are very efficient. The leading particulars are given in the table. Some of each class are being equipped with fire tubes, the 4–6–0's being supplied superheaters and piston valves, with Walschaert gear in addition.



NEW YORK, NEW HAVEN AND HARTFORD RAILWAY LOCOMOTIVE, NO. 1095.
Built at the Baldwin Locomotive Works, Philadelphia.

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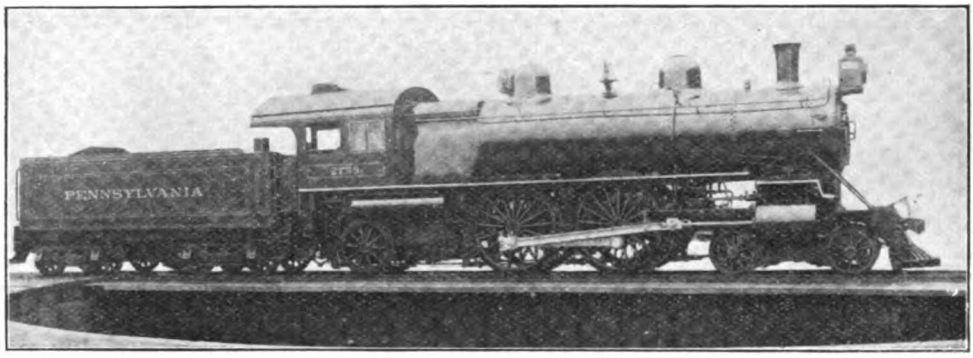

PENNSYLVANIA RAILWAY LOCOMOTIVE, NO. 2759.

	4-6-0	4-4-2	4-6-2
Builder :	Baldwin	American Loco. Co.	American Loco. Co.
Date :	1904	1907	1907-8
Valves :	Balanced Slide	ditto	ditto
Gear :	Stephenson	Walschaert	Walschaert
Cylinders :	20 by 26	21 by 26	22 by 28
Wheels :	72 in.	79 in.	73 in.
Heating surface :	2,500 sq. ft.	3,234 sq. ft.	3,948 sq. ft.

Between Stamford (where the electric zone ends at present) and New Haven, 39·9 miles, there are 12 trains the average of which is over 50 miles per hour. The road is a difficult one. From Stamford there is a four-mile bank, which I should put at about 1 in 200 (unfortunately, banks are not marked here). There are two speed restrictions—one of 37 miles per hour and the other of 30—both on account of curves. The first has a rising bank from it in either direction, and is, therefore, a great handicap. From New Haven there is a five-mile bank of about 1 in 200. There are no mile-posts by which to time trains, but the time table gives the distances between stations accurately, and bridges which will carry the wires for extension of the electric system to New Haven are one-sixteenth mile apart, so that four spaces, making a quarter-mile, furnish a good method for estimating speed readily.

The " Bankers' Express " is the fastest on the road, covering the 39·9 miles from New Haven to Stamford in 43 min. (55·5 miles per hour). As the five-mile bank from New Haven occupies 8 min., it means, with the two slow downs, that a speed of about 70 miles per hour must be maintained. It is hauled by a 4–4–2, and usually consists of five coaches, one parlour and one buffet car, making about 300 tons. Six Limited trains (three each way) cover the 231 miles between New York and Boston in five hours. This is not so bad as it appears, considering that the 33 miles on the electric division requires 50 min., and that there are two stops of 3 min. duration each and two of 5 min. each (198 miles in 234 min. for locomotive work). The usual load is six parlour cars and one dining car (490 tons), hauled by a 4–4–2. With a load of six (420 tons) I have covered a distance of 3·61 miles on a slightly rising gradient in 3 min. 9 sec. by stop watch, or 69 miles per hour. The time from Stamford to New Haven was 40 min., a gain of 5 min. on the running time. This shows what a moderate sized 4–4–2 will do when kept in first-class shape. The 4–6–2's work the heavier trains, some of which make the 39·9 miles in 46 min. The 4–6–0's are confined to slower trains and locals. These locomotives can accelerate a train more rapidly than any engines I know, as the following instance shows. Distance between two stations is 3·61 miles—the same stretch as that quoted above but running in the opposite direction—the gradient is slightly falling, and the leaving times from the two stations are 5 min. apart. Allowing 45 sec. for the duration of the stop, it makes the running time 4¼ min. This is always kept with a load of five coaches (175 tons). Once when the train was late I recorded a time of 3 min. 46 sec. The speed reached two miles from the start was 85 miles per hour. At this point the speed is regularly 80.

In contrast with results in England, where 4–6–0's and 4–4–2's are competing in express work, the favour lies wholly with the 4–4–2's. This is, of course, due to the fact that full advantage of firebox room is taken on a 4–4–2, as is not usually done in England. Thus the 4–4–2 is made the more powerful of the two, and in many cases the more economical. A wide firebox produces a slower rate of combustion per square foot of

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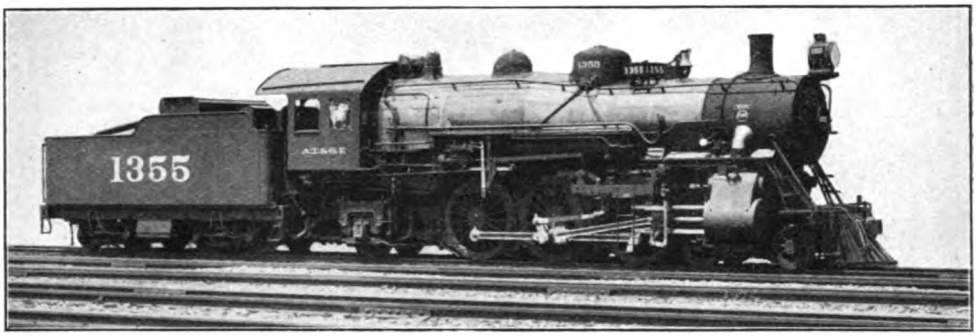

ATCHISON, TOPEKA, AND SANTA FE RAILWAY COMPOUND SUPERHEATER LOCOMOTIVE.
Built by the Baldwin Locomotive Works, Philadelphia.

grate area, and if not too large in proportion to the flue area, should show economy over a narrow firebox. Another railway still using many 4–4–2's is the Pennsylvania, on the New York division. Many of these were built in 1902-3 by the American Locomotive Co.—some with balanced slide valves, some with piston valves, either actuated by the Stephenson motion. Quite a number were also built at the Company's shops. The cylinders of these engines are 20½ by 26 in., driving wheels 80 in., and heating surface 3,000 sq. ft. They are now being equipped with superheaters and the other necessary alterations required. This company, like the New York, New Haven and Hartford, keep their passenger engines in splendid repair and clean, and in that way remind one of the English method of doing things. The De Glehn compound, imported by the Pennsylvania in 1904, has been standing idle outside the Altoona shops for a long while. The engine was too small for the service intended.

In regard to compounds, the Sante Fe is the only railway which continues to order them for passenger work. They are of the Vaulclain four-cylinder balanced type. The last batch built by Baldwin in 1912, as were most of the others, are 4–6–2's. High pressure cylinders (17½ by 28 inside) are inclined, and the piston rod is elongated so that the connecting rod will clear the first driving axle. The low pressure (29 by 28 outside) are horizontal. Both sets drive on the second driving axle, with each high pressure 180° from the adjacent low pressure cylinder. Each pair of high pressure and low pressure cylinders have a single piston valve for steam distribution actuated by Walschaert gear. This arrangement must be inferior to the four valves with four gears as used on the Continent. Steam is highly superheated by the Schmidt system; driving wheels are 73 in., and the heating surface 3,443 sq. ft., superheater 619 sq. ft.

As to four-cylinder balanced simples, there are two of which I am aware, these being 4–4–2's built by the American Locomotive Co. for the Rock Island R.R. in 1909. The four cylinders are placed side by side, and connected to the first driving wheel axle. Two large piston valves actuated by Walschaert gear distribute the steam—one for the two right-hand cylinders, and one for the two left. The principles of these valves are shown in the sketch. This admirable arrangement appears to me to be superior to any of the four-cylinder types. I cannot see the advantage of having four valves with four gears or even four valves with two gears when an arrangement like the above is possible. The argument that independent cut-off for each cylinder is advantageous is well enough in the case of compounds, but in a simple engine where all the cylinders are exactly the same diameter and stroke, the cut-off that is economical for one cylinder must be also economical for the others.

These locomotives have cylinders 17½ by 26 in., wheels 73 in., heating surface of 2,715 sq. ft., and superheating 479 sq. ft. The repairs on such an engine should be very little more than a two-cylinder engine. One of these locomotives when tested on the same trains against a two-cylinder simple and a four-cylinder compound, all having about the same boiler capacity, showed a marked saving over both and made better time.

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The Lancaster and Carlisle Railway. (No. I.)

By HERBERT RAKE.

COAT OF ARMS OF THE ORIGINAL COMPANY.

TRAVELLERS now-a-days talk of the West and East Coast Routes in a manner that would lead one to believe that they had always been known by these designations, but, as a matter of fact, it was many years after they became through routes between England and Scotland that those names came into being.

The Liverpool and Manchester Railway had been opened since September, 1830, and in September, 1832, the Wigan Branch Railway, from Parkside Junction on the former line, to Wigan—a distance of 6 miles 72 chains, with a branch to the Leeds and Liverpool Canal, 2 miles 54 chains long, known as the "Springs Branch"—was opened; while on October 31, 1838, the Preston and Wigan line, 22 miles 18 chains long, was opened. Before the latter line was opened, however, it was amalgamated with the Wigan Branch Railway in 1834 under the name of the "North Union Railway." The Grand Junction Railway between Birmingham and Warrington had been inaugurated in 1837, but two years previous to that date it had purchased the Warrington and Newton line (opened in 1833), which connected with the Liverpool and Manchester Railway at Newton Junction, while the opening of the London and Birmingham line in 1838 made a through connection between London, Liverpool, Manchester and Preston.

In 1840 the Preston and Wyre Railway was opened to Fleetwood, and the result of all these completions was that in 1841 passengers leaving Euston in the early morning and travelling *viâ* Birmingham, Parkside Junction and Preston could, owing to the development of Fleetwood Harbour, proceed to that place and there take steamer to Ardrossan, to reach Glasgow by the Glasgow, Kilmarnock and Ayr Railway, or Edinburgh by coach early next morning. The *Railway Times* of that period remarked: "What more could any reasonable man want? If he were to travel the whole way by rail at 20 miles an hour he could but arrive two or three hours earlier, before breakfast was ready or any one up to bid him welcome at his inn." By Act of July 16, 1846, the Grand Junction (which had previously acquired the Liverpool and Manchester line), the London and Birmingham and the Manchester and Birmingham Companies, were amalgamated under the title of "The London and North Western Railway." Eleven days after the amalgamation the new Company leased the North Union Railway jointly with the Lancashire and Yorkshire Railway.

The opening of the Fleetwood route to Scotland impressed upon George Hudson ("the Railway King") and George Stephenson, who were both interested in the North Midland, Midland Counties, York and North Midland and Great North of England Railways, the necessity of proceeding at all speed with the construction of the present East Coast line between Darlington (the line "furthest North" in 1841), Newcastle, Berwick and Edinburgh. By the London and Birmingham and Grand Junction Companies this policy of expansion on the part of the two "Georges" was viewed with great suspicion, not to say anxiety, and the latter Company accordingly instructed their Engineer, Joseph Locke, to make a survey of the country between Preston and Carlisle and to report, with a view to constructing a line to the Scottish Border. The hilly country of Westmorland had always been regarded as an impassable barrier to the

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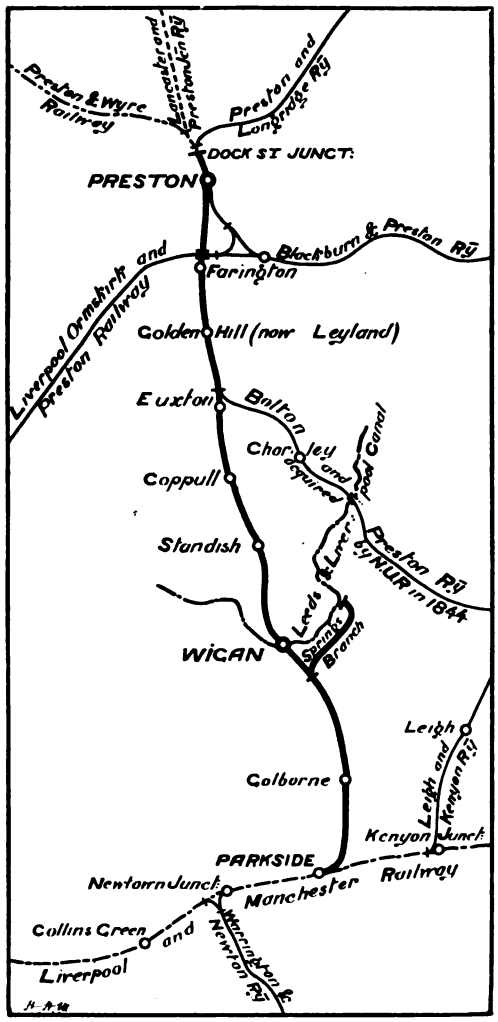

NORTH UNION RAILWAY (WEST COAST ROUTE SECTION), SHOWING THE ORIGINAL STATIONS ON THE LINE.

laying out of any railway in a direct northern course, and when the question of communication with Scotland first came to the front in 1836, George Stephenson, who was consulted on the subject, reported that it would be necessary to cross a portion of Morecambe Bay by an embankment and to skirt the coast of Cumberland as far as Maryport, there to join the then projected Maryport and Carlisle Railway.

A circular letter was afterwards issued by "The West Cumberland Railway," which referred to the above means of reaching Carlisle as the most expeditious, certain and safe method that could be obtained, and recommended that everyone interested in the prosperity of the district should exert himself to forward the project. The circular concluded: "If you do not bring forward this line of railway, and support it with all your might, West Cumberland will for ever remain in the back settlements." Quoth Hudibras, "What moves my mind is what shall move all human kind." But the West Cumbrians were not to be "drawn," and the scheme was never proceeded with. As will be seen later on, various other projects were afterwards suggested, and several routes surveyed. Naturally the inhabitants of the various towns and villages in the vicinity of the routes proposed were anxious that the line should pass through or near their towns, the inhabitants of Kendal being especially keen that they should not be "left out in the cold." Their disappointment may, therefore, be imagined when they found that Mr. Locke in his report proposed to keep the projected line some distance to the east of that town and to pass through Oxenholme and over Shap Fell; and when they learned that the line as finally fixed upon, was not to come nearer Kendal than Oxenholme, they promoted a separate line entitled the "Kendal and Windermere Railway," of which more anon.

Before this had occurred, however, the people of Lancaster had convened a public meeting (on April 12, 1836), and promoted an independent Company called the "Lancaster and Preston Junction Railway," with the result that an Act was procured on May 5, 1837, with an authorised capital of £250,000, for a line from Lancaster to Preston, the length being 20½ miles. In March, 1840, a second Act was obtained authorising the Company to raise by loan £125,000. The line was opened on June 26, 1840, six years before the completion of the Lancaster and Carlisle line. The course of the line was very direct, running practically due north and south, by way of Galgate, Scorton, and Garstang. There were two rather considerable viaducts—one at Galgate, consisting of six semi-circular brick arches, each of 30 ft. span faced with sandstone. From the ground to the surface of the rails the height of the bridge was 39 ft., and its total length 265 ft. The other bridge which spans the river Wyre, a little to the north of Scorton station, consisted of six semi-elliptical arches of 30 ft. span, each with piers resting on concrete, the total length of the structure being 263 ft.

The gradients of the line were very easy, in no case exceeding 1 in 500, and the only sharp curve was one of 20 chains radius at

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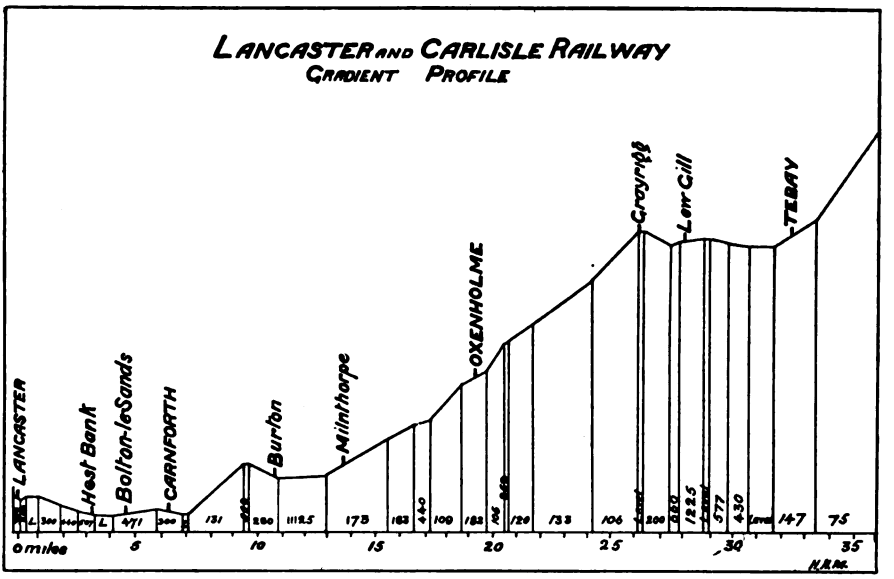
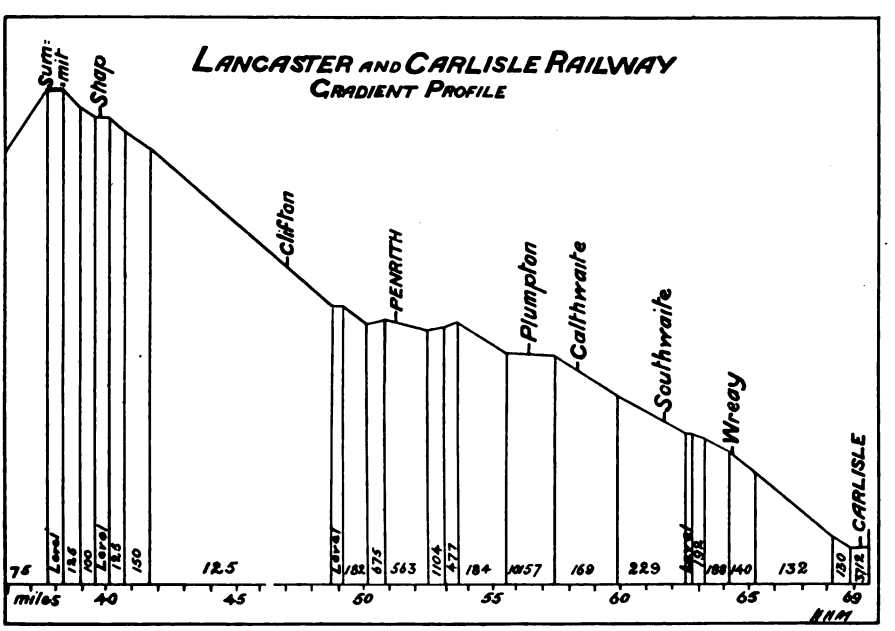


Preston, where the line joined the North Union Railway. In Lancaster the terminus was at the upper end of the town, about a mile eastward of the present Castle station. It was planned to allow for an enlargement, and upwards of 6 acres of land were acquired to provide accommodation for repairing shops, on a further extension of the line northwards. When the Lancaster and Carlisle line was opened this station was closed for passengers, and converted into a goods depôt. At the Preston end there was no proper station for some time after the line was opened, the trains starting and stopping at what is now known as "Dock Street Junction," where the North Union line terminated, on the north side of the present viaduct carrying Fishergate across the railway and lying 16 chains north of the present station. The platform was reached by a flight of steps from Fishergate. Rails used were of the parallel form, weighing 65 lbs. per yard, secured to the chairs by wooden keys. Locomotive power was supplied



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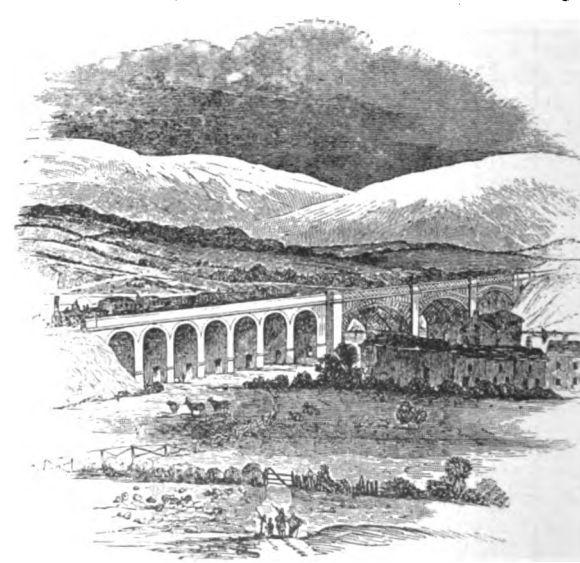
LANCASTER STATION.
(Reproduced from the "Illustrated London News").

under contract by the North Union Company.

In 1842 the line was leased to the Lancashire Canal Navigation Company for 21 years from September 21, at a rental of £13,000 per annum, but the lease was terminated on August 1, 1849. In 1844 an agreement was entered into between the North Union Railway and the Canal Company whereby the Lancaster and Preston Railway Company was to be allowed the use of the North Union station for passenger traffic from and after February 12, one of the conditions being that "one efficient porter" should be provided. The present station at Preston, which occupies the site of the old North Union station, was erected about 33 years ago, and was enlarged in 1903. It took the place of a much inferior structure. Half a mile north of Preston station, the Lancaster and Preston line was at one time crossed on the level by three sets of rails, one being the Mandlands Railway and the other two those of the Preston and Wyre Railway, which at one time had a separate terminus on the east side of the Lancaster and Preston Junction line. This level crossing was abandoned some time ago. On November 13, 1848, an agreement was entered into between the Lancaster and Carlisle Company and the Lancaster Canal Company whereby the former assumed the management of the Lancaster and Preston line and the Lancaster Canal Company.

On July 2, 1849, at a special meeting, the shareholders of the Lancaster and Preston Junction Company confirmed the transfer of the line in perpetuity to the Lancaster and Carlisle Company as agreed upon on May 24 previous, and on the same day at special meetings of the Lancaster and Carlisle and Lancaster Canal Companies sanction was given to their share of the arrangements, which were confirmed by Act 13 Vict. Cap. 81 (August 1, 1849). For all intents and purposes, therefore, the line between Preston and Carlisle belonged to one Company from August 1, 1849, and continued to be worked as such until 1859, when the London and North Western Company absorbed both lines. The first meeting of the proposed Lancaster and Carlisle Railway was held in Carlisle on October 2, 1841, and was attended by deputations of the Grand Junction, London and Birmingham and other Companies interested, and a committee then appointed reported to a subsequent meeting that the route proposed to be followed was that from Lancaster along the Lune Valley to Kirkby Stephen, thence *viâ* Orton, Crosley Ravensworth and Askham to Penrith and thereafter virtually following the line of the present route to Carlisle—a distance of 61 miles. The inhabitants of Kendal and the surrounding district, feeling themselves completely left in the lurch, became exceedingly



BRIDGE OVER THE LUNE.
From the Churchyard, Lancaster.
(Reproduced from the "Illustrated London News").

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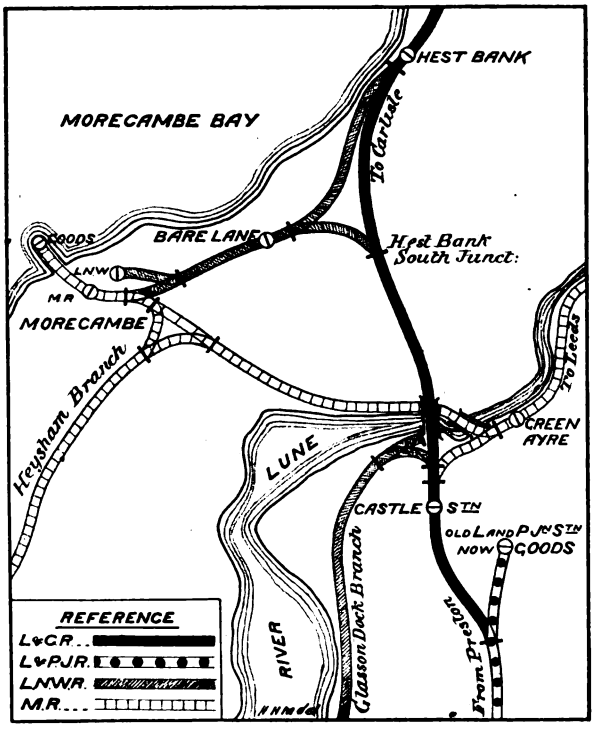
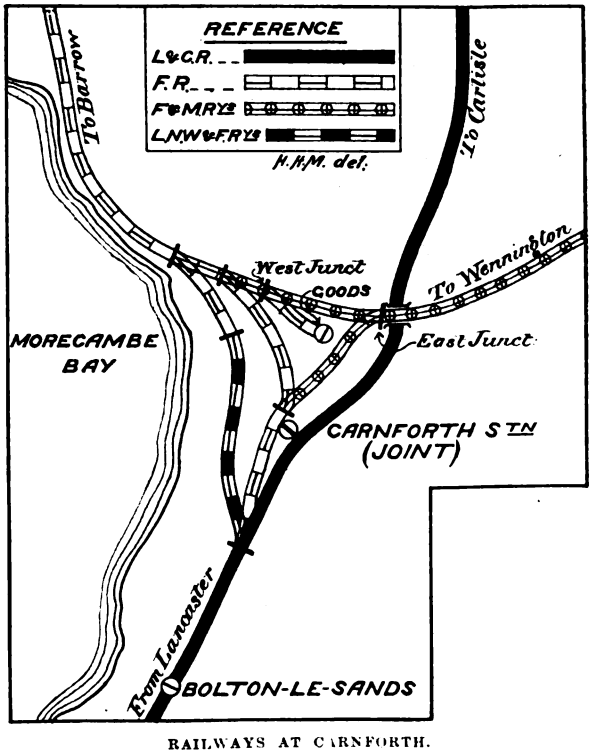


RAILWAYS AT LANCASTER.

wroth, and proposed another route leaving Lancaster, and following the valley of the Kent, passing by Kendal and proceeding onwards to Penrith and Carlisle.

An arrangement would appear to have been concluded between the promoters of the two routes, as Mr. Locke, who made a cursory inspection of the country in 1836, prepared a survey as to the practicability of a route up the valley of the Lune, thence *viâ* Grayrigg Fell and Shap Fell towards Penrith and Carlisle. In his later report Mr. Locke reported that, while the Lune Valley line was the shorter by 1½ miles, and had no steeper gradient than 1 in 147, the Kendal line had a gradient of 1 in 110, but served a more populous district than the other route, that the Shap Tunnel would not be more than 850 yards in length, and possibly could be further reduced. During 1842 the West Cumberland party, whose scheme of 1836 has already been referred to, again came to the front, and revived the West Cumberland project, having new surveys made for a line *viâ* Carnforth and Ulverstone towards Whitehaven. This scheme, together with the opening of the Lancaster and Preston Junction Railway, and the energy displayed by the promoters of the East Coast line, who were pushing on the Great North of England line from Darlington northwards to Newcastle and Berwick, promptly had the effect of expediting matters, and the line as finally agreed upon was to start from Lancaster, proceeding *viâ* Carnforth, Oxenholme (about a mile to the east of Kendal), Tebay, Shap, and Penrith to Carlisle.

This line—which in the first instance was to be a single one—was converted into a double line when the Caledonian Railway Act was passed in 1845. The share capital of the company was £1,306,000 with borrowing powers to £435,333. The Bill was lodged in Parliament in November, 1843, and it received the Royal Assent on June 6, 1844. In the same year the Grand Junction and



RAILWAYS AT CARNFORTH.

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North Union Companies each agreed to contribute £50,000 towards the railway, and the latter company further agreed to make good the deficiency of £15,000 caused by the inability of the Lancaster and Preston Junction Company to find the amount of their contribution. As soon as the Act had been obtained the engineers—Messrs. Locke and Errington—lost no time in arranging for the construction of the line, and the contract was let to Messrs. Mackenzie, Stephenson & Co. (of which firm Thomas Brassey was the principal partner), and on July 8, 1844, the first sod was turned at the foot of Shap Wells, near the Birk Beck, about 33 miles north of Lancaster. The line started from a junction with the Lancaster and Preston Junction Railway, at a point 45 chains south of their Lancaster terminus, whence it proceeded northwards to the Castle station of the Lancaster and Carlisle Company—a distance of 1 mile 8 chains.

Between the years 1850 and 1862 the Castle station became a junction of considerable importance as regards the traffic to and from the North, through the opening of the North Western (now part of the Midland Railway), which to distinguish it from its great rival became known as the "Little North Western Railway." This line was opened to Lancaster—Green Ayre—on October 31, 1849, the connecting loop between Green Ayre and the Castle stations being first used in December of the same year. In June, 1850, through carriages were run between Bradford, Leeds and Kendal. The "Castle" also became the exchange station for passengers travelling between Scotland and the Midlands.

But after the opening of the Ingleton and Low Gill branch of the Lancaster and Carlisle Railway in the autumn of 1861, the Midland north traffic was diverted to that route, and Lancaster became of little importance as a junction. The service between the two stations, discontinued during the "'seventies," has since been resuscitated to the extent of five passenger trains from and four to "Green Ayre" and a few goods trains each way daily, but the traffic is not of much account. The Castle station buildings were of white freestone of a very neat design, and when originally erected were as shown in an accompanying illustration. Very few alterations were made until 1898, when a new and more commodious structure was commenced. This was completed early in 1900.

LOWTHER VIADUCT.
(Reproduced from the "Illustrated London News").

On leaving Lancaster the river Lune is crossed by a bridge which, as originally built, consisted of seven brick arches of 53 ft. span each and three laminated timber arches each of 120 ft. span. It had a very ornamental appearance, the height above the water being 60 ft. After crossing the Lune, the line proceeds shorewards towards Morecambe Bay and Hest Bank station, a small watering place, which before the railway was opened, could be reached by the Lancaster and Kendal Canal. After crossing the river Keer and the turnpike road from Lancaster to Milnthorpe by an over-bridge, Bolton-le-Sands is passed and Carnforth reached. When originally erected the latter station was merely a roadside station, known by the name of "Carnforth-Tealand," Tealand being a small village about a mile or two to the north. It was not until the Ulverstone

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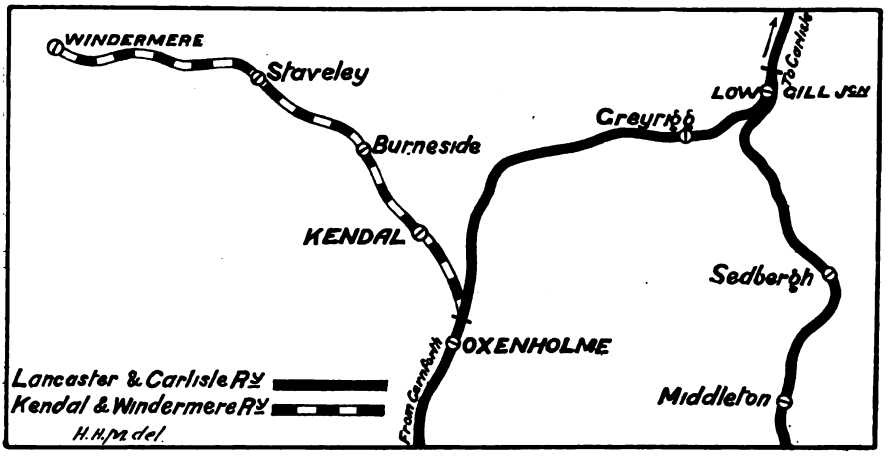
and Lancaster Railway (now part of the Furness Railway) was opened in 1857 that it became a junction of any importance, which increased when the Furness and Midland Joint Railway was opened from Wennington Junction to Carnforth to connect the "Little North Western" and the Ulverstone and Lancaster Railways. This joint line, worked by the Midland and maintained by the Furness Company, was opened in June, 1867. It is 9½ miles long, with a branch of 20 chains running into Carnforth station, and has been made "joint" between the London and North Western and Furness Railways.

Carnforth has also become a very important postal centre, no fewer than nine mail trains arriving and departing between 9 p.m. and 4.30 a.m. Furness line mails arrive at 9 and 9.52 p.m., and leave at 4.25 a.m. The up Scotch (old "Limited") Mail and the Special Postal Mail arrive at 10.4 and 10.44 p.m. respectively, and the down special postal at 1.34 a.m. The down Scotch Mail does not stop, and the Furness line mails are forwarded by a local mail which leaves Preston at 3.35 a.m., arriving in Carnforth at 4.15 a.m. The Leeds and Normanton mails which leave at 12 midnight and arrive at 12.35 a.m. close the list. After leaving Carnforth 30 ft. above sea level, Burton is passed, and the passenger goes from Lancashire into Westmorland. After crossing the river Beetha, Milnthorpe is reached. When erected, this station was very substantial, and was one of the best in point of accommodation on the line; but it has now reverted to the original status of Carnforth and become a roadside station. After Milnthorpe, the Lancaster and Kendal Canal is crossed, and the next work of importance is the Sedgwick embankment, which was completed in a little over 12 months. It is a quarter of a mile long, 50 ft. high, and contains 150,000 cubic yards of earthwork. Beyond Natland, the line crosses the turnpike road by a handsome skew bridge, and then reaches Oxenholme Junction, 19 miles from Lancaster and the junction for the Kendal and Windermere Railway. In this neighbourhood a serious accident occurred on November 14, 1846, when the line was on the eve of being opened. A party of subcontractors and other persons engaged on the line had gone on a pleasure trip to Shap, to celebrate the completion of the line. Two of the Company's engines had been procured without their consent and in returning to Oxenholme one of the engines which had gone on in front and arrived at its destination was left standing on the line, when the second engine arrived and dashed into it. The first engine was smashed to pieces, those upon it being severely injured and thrown about in all directions. One person was dashed into the furnace and severely burnt, while others were greatly injured. The description of the accident concluded with the remark that "the engineer absconded."



LANCASTER AND CARLISLE RAILWAY: OXENHOLME AND LOW GILL SECTION.

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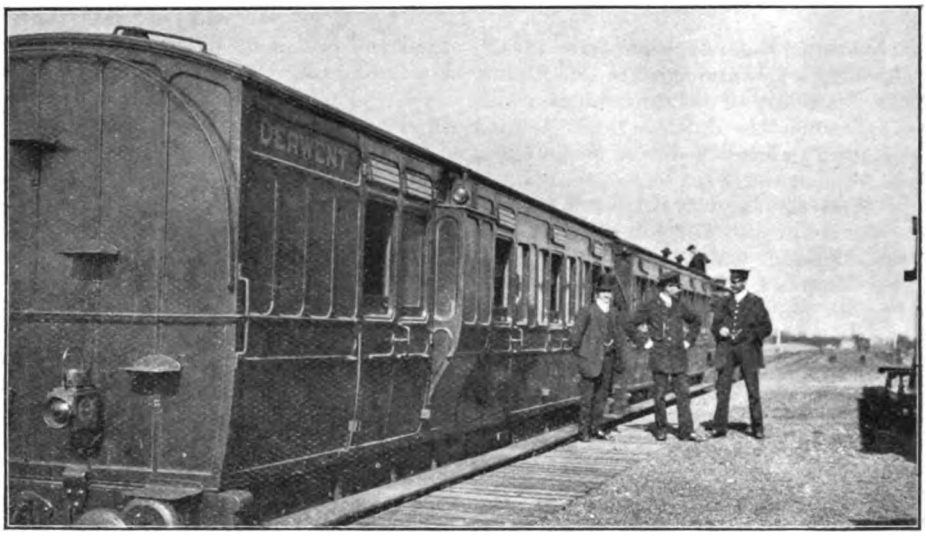

DERWENT VALLEY RAILWAY TRAIN AT CLIFF COMMON STATION.

The Derwent Valley Light Railway.

By T. PRESTON.

To quote the words of a local paper, the opening of the Derwent Valley Light Railway "marks an epoch in the history of Yorkshire agriculture." This line, which is 16 miles long and has its terminus at York, was formally opened to the public in July last, and an account of its conception and working may therefore be submitted to readers of the RAILWAY MAGAZINE. If we look at a map of the East Riding of Yorkshire, we find that, to the South-east of York, there is a large stretch of flat agricultural country enclosed in a triangle of railways. The western side of this triangle is formed by the main line of the North Eastern Railway between York and Selby, about 14 miles long. From York and Selby respectively two branch lines go out eastward to Market Weighton, which forms the eastern point of the triangle.

Within that area there are a great many country villages and outlying farms, which produce annually a large amount of corn, potatoes, and other crops, besides live stock traffic. For the last 15 years or more, many villages have realised the inconvenience of being so far from the nearest station, and there have been constant agitations for increased railway facilities. As a result the Derwent Valley Light Railway has been constructed. The map on page 337 shows that the new railway opens up a tract of country in the centre of the triangle mentioned, and there is no doubt that it will prove of enormous benefit to the district which it serves. The idea of a railway was first seriously thought of in 1902, when the Rural District Councils of Escrick and Riccall got an order empowering them to make the line. Thus they gained the distinction of being the first Rural District Councils to obtain an order under the Light Railways Act of 1896.

Owing, however, to lack of money, nothing was done for several years; and in 1907 a fresh order was granted, forming the present company with its title of the "Derwent Valley Light Railway Company." The Chairman was the late Lord Wenlock, of Escrick Park, who was from the first a firm believer in the project. He was a Director of the North Eastern Railway for many years, and worked very hard to make the Derwent Valley line a success. Much of it passes through the Escrick property, and it is greatly to be regretted that Lord Wenlock did not live to see the line opened. In the order of 1907, the Rural District Councils guaranteed a minimum dividend of 3 per cent. on the ordinary shares for ten years after the opening of the line, if it failed to earn that amount, the maximum liability to be £1,500 a year. It should, however,

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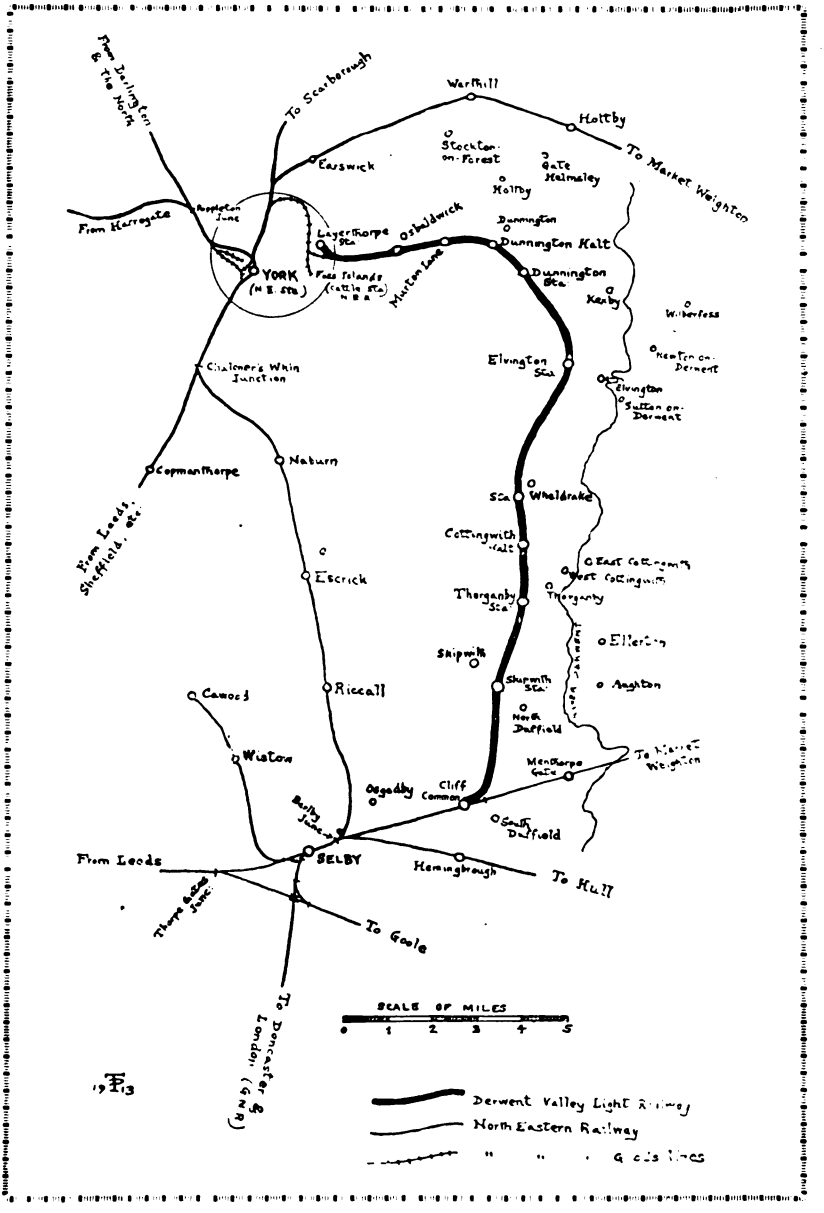
be mentioned that the principal landowners through whose property the line runs have indemnified the Councils against such liability to the extent of one half. The authorised capital of the Company is

ment was entered into between the Derwent Valley and North Eastern Companies. Therein it was provided that the North Eastern should supply the engine power and enginemen, and the Derwent Valley



MAP SHOWING THE DERWENT VALLEY LIGHT RAILWAY AND NORTH EASTERN RAILWAY CONNECTIONS IN THE DISTRICT.

£81,000, made up of £31,000 Preference and £50,000 Ordinary.

The scheme was approved by the Board of Trade in 1907, and in May, 1908, an agree-

Company the carriage and wagon stock. The former further agreed not to run any motor buses or wagons to compete with the latter. It was further stipulated that the

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line should be made strong enough to carry any engine the North Eastern Company might choose to send on to it. In July, 1908, the Derwent Valley Company found themselves still unable to raise the necessary capital; but in September, 1909, the money difficulty was at last at an end, and negotiations were opened for the land required. The construction of the line was started about May, 1911, Messrs. Pethick and Dix being the contractors and Mr. E. Ferguson, of Chesterfield, the engineer, with Mr. J. Stafford as resident engineer.

Considering that the country traversed is very flat, and that there was little or no bridging to be done, it must be admitted that the construction of the line took place very slowly. But on October 20, 1912, the portion between Wheldrake and Cliff Common (7 miles) was opened for goods traffic only, the three stations opened being Wheldrake, Thorganby and Skipwith. Considering the very bad season last year, the result has been most encouraging, 9,568 tons having been dealt with up to the end of May, 1913. The northern part of the line was the last to be finished, and the formal opening took place, as already stated, in July this year. Directors, officials and a large party of guests proceeded to Layerthorpe station (the York terminus of the railway), where the first passenger train was ready to start. It consisted of two Derwent Valley Railway coaches (painted dark blue), two Derwent Valley wagons fitted with seats inside, and a guard's van. The North Eastern Railway single-wheel tank engine No. 1679 was attached, in charge of driver Frank Pickup, who has made numerous journeys all over the North Eastern Railway with special and other trains.

Both engine and train were decorated with flags, and two light-blue ribbons were fastened from the engine to the platform railings. These were cut by Lady Deramore (wife of the Chairman), thus formally setting the train free. Passengers took their seats, and it steamed out of the station amidst loud cheers, repeated at the various wayside stations which it passed on its way over the line to Cliff Common. On arrival there, the engine was changed to the other end of the train, and the party returned to York, where they had luncheon. The Lord Mayor of York proposed "Success to the Derwent Valley Light Railway," which was responded to by the Chairman, Lord Deramore, who gave a short history and description of the railway, and concluded by saying that he hoped they would all meet before long to celebrate the doubling of the line.

So far as passenger traffic is concerned, there is no physical connection at York between the Derwent Valley and the North Eastern Railways, the Derwent Valley Company's Layerthorpe station being quite in another part of the town, but goods traffic can be exchanged by means of a line which connects the Derwent Valley Railway with the North Eastern Railway Company's Foss Islands Branch.

As regards the construction of the line, the term "light" is a little misleading, because the rails weigh 80 lbs. per yard. It may be added that they were bought second-hand from the Midland Railway, having done duty on that Company's Settle and Carlisle line. There is only one overbridge and one underbridge on the whole 16 miles of the railway, and virtually no cutting or embankment work. The line runs through a district which is as flat as the proverbial billiard-table, with no obstacles except numerous country roads, which necessitate a large number of level crossings and gates. The stations are all very neat and artistic in appearance; the buildings are of white wood, picked out with black or dark green, with red tiled roofs, which give a much more pleasing effect than the brick buildings so often seen at country stations on the large railways. The complete absence of any advertisement posters (at present at any rate) is also very noticeable, and the only thing open to criticism is the platform surfaces, which usually consist of very rough cinders.

By referring to the accompanying map, it will be seen that there are 9 stations and two "halts." The latter, Dunnington Halt and Cottingwith, consist simply of platforms and booking offices, with no sidings. Osbaldwick and Murton Lane each have one siding, while the other stations have considerable siding accommodation, with weighbridges, loading docks and cranes. At Wheldrake there is also a water column for engines. Each station has only one platform. There are no signals whatever on the railway, nor are they needed, as only one engine is allowed on the line at a time. Safety is ensured by the driver carrying a small brass staff. This also acts as a key for unlocking points connected with the single line, thus making it impossible for any points to be opened unless the engine and staff are at the station. All facing

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points on the running line are locked by McKenzie & Holland's central plunger arrangement, and worked by levers on the ground.

At Cliff Common, the southern terminus of the railway, there are exchange sidings connected with both the Derwent Valley Railway's single line, and the North Eastern Railway. The Derwent Valley Railway train has a separate platform and waiting room behind the North Eastern station. The train service consists of three trains each way, and these cover the distance between York and Cliff Common, including stops, in about 50 minutes. In addition the line itself; all goods going on to another railway have to be loaded in North Eastern or other "foreign" wagons. As stated earlier, the engine power is supplied by the North Eastern Railway, and at the time of writing the locomotive in use is No. 174, an old six-coupled goods engine built at Gateshead in 1875 to the late Mr. Fletcher's designs. This engine belongs to the numerous "398" class, having cylinders, 17½ in. by 24 in., and coupled wheels, 5 ft. diameter.

The driver and fireman are North Eastern men, but the guard, stationmasters and the rest of the

CLIFF COMMON STATION, NORTH EASTERN RAILWAY.
The Derwent Valley Company's office and platform is on the left.

there is a fourth train from York to Wheldrake and back, and on Thursdays and Saturdays an extra train from Cliff Common to Wheldrake. The trains are timed to connect at Cliff Common with the North Eastern trains to and from Selby, and are all "mixed" trains—passenger and goods, the wagons being attached behind the carriages.

The Derwent Valley Company has its own passenger stock—two six-wheeled carriages bought from the North Eastern Railway, one being a third-class carriage and the other a "brake composite." There are also a few Derwent Valley Railway wagons, but these are used only for traffic on staff belong to the Derwent Valley Company.

Mr. J. L. Clewes, General Manager, entered the service of the Midland Company at Leeds 23 years ago, and after a time was placed in charge of each section of the district goods manager's office. Later he was transferred to Shipley as district representative for the North and West Ridings of Yorkshire, and in 1910 took up a similar position in the Birmingham district, being chief agent for Oxford and Warwickshire. Thence he went to headquarters as general inspector to the chief goods manager, resigning that position to take up his present appointment.

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The Ais Gill Disaster and Its Lessons.

FORTUNATELY, it is rare that the general public is so intensely moved as it has been by the accident at Ais Gill, Midland Railway, including as it did so many similarities to the Hawes Junction catastrophe of Christmas, 1910. But it is well to remember that, from a railway point of view, an accident is an occurrence to be investigated in order to ascertain wherein organisation and methods are in fault, and to devise means whereby recurrence may be avoided, associated events, however disastrous, being more or less incidental. It may easily happen that a " serious " accident has relatively minor results ; while a " small " accident—such as that at Wellingborough, Midland Railway, where a platform trolley fell upon the line—may cause disastrous developments. Therefore, while sincerely sympathising with the relatives of the victims of the Ais Gill accident, and with the Midland Company, it is right to dissociate the accident itself, with its direct and contributory causes, from the results that principally concern the public. From this point of view the issues involved are : (1) Why the engine of the first train became " stalled " ; (2) why the engine of the second train called for such attention that the enginemen passed signals at danger without observing them ; (3) means whereby such non-observance of signals may in future be prevented, including such matters as cab signalling and automatic arrangements for directly controlling trains ; (4) risk of fire attending the prevailing practice of building carriage superstructures mainly of wood ; (5) gas *versus* electric lighting for railway trains ; (6) the inclusion of tools and rescue appliances in the equipment of trains ; and (7) special means of conveying an urgent alarm to a following train. At this moment it is neither necessary nor appropriate to criticise too closely the actual conditions which prevailed on the morning of September 2nd. Major Pringle's report will, it is certain, devote careful attention to all such matters, and until that document has been issued, the subject is, of course, *sub judice*. It is well, however, that the Midland Company should have courted the fullest publicity. But, because investigations of this class may be conducted *in camera*, it does not follow that elements of unfairness exist, or that there is anything to be concealed. In this instance there are several aspects of the matter which may at once receive attention without the smallest impropriety.

Engine " Weakness."

This term is used, in preference to engine " failure," in the sense that it will cover temporary weakness—due to poor coal, leaky tubes, faulty injectors, hot bearings, etc.—as well as inability to perform an allotted task. Bearing in mind the large scale upon which railway operations are conducted, it is easy to understand that even express engines may have to take inferior coal, or to use good coal that has deteriorated by long exposure to weather, is unusually small, includes a large proportion of small coal, or is liable to clinker. With good coal, a fire kept clean and bright, and with careful manipulation to prevent the formation of clinker in the firebars, a driver should be able to do all that his engine is called upon to do and a little more. But it may not require much to place him in difficulties if he has inferior coal or good coal in an inferior condition, especially if a little less skill than usual be displayed in firing and management of the engine. Faulty injectors or lubricators, a " big-end " or bearing that is inclined to run hot, or a little mismanagement of the water supply may introduce difficulties on a heavy run, especially if maximum or over-maximum load is being taken or the weather is unfavourable. Such matters at once require attention, though they may not be serious enough to warrant stopping, giving up a train, or taking assistance. It is by no means unusual for drivers to go to the front of their engines while travelling at full speed, in order to see

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that a lubricator is feeding properly or to replenish it, or to ascertain that a suspected weakness is not unduly manifesting itself. For such purposes a clear stretch of line is, of course, selected, and there are many such sections where, after observing a signal, no others are met with for several minutes, allowing the driver ample time to get back to the footplate for his next signal observation. In fact, such observations can be made by him while he is in front of his engine, though the risk of overlooking the signal is then greater. But it is easy to understand that if special attention be called for, more than the two or three minutes available may be occupied, and the same may be said in regard to dealing with any difficulties which have arisen on the footplate itself. The risk of overlooking signals then becomes serious, and although driver and fireman may be accustomed to work together, each being thoroughly reliable, capable and trustworthy, there is always the possibility of a misunderstanding, the driver believing that the fireman is keeping the required look-out instead of himself, and the fireman supposing that the driver is still prepared for any eventuality. There are, indeed, many possibilities—fortunately, they rarely proceed beyond that stage—which may affect conditions on the footplate. As a rule the enginemen are on the *qui vive* for anything, and if there be a slight uncertainty from any cause they evince nervousness until the real facts have been ascertained. But it requires only a slight evidence of "human frailty" to introduce conditions that may be dangerous. All honour to our enginemen that they appreciate as strongly as they do the responsibility which ever rests upon them, and because they are so seldom caught napping in directions which are considered quite excusable in other and "stay-at-home" ranks of life.

Cab-Signalling and Automatic Train Control.

The great advantage of cab-signalling is that the indication is given directly in the engine cab, thus offering a further and more continuous indication than is obtained by observance of fixed signals along the line. From this point of view cab-signalling is altogether desirable, especially if it also include automatic control of an engine by applying the brakes independently of the driver if an adverse signal has been passed. Theoretically the suggestion is entirely to be approved, and there are many devices which effect such results more or less satisfactorily. The trouble is, however, that such devices will not quite meet every requirement. They include special equipment which has its own liabilities to breakdown, however slight. There is the danger that a driver will rely too implicitly upon their operation. The possibilities of failure or misdirection are probably equivalent to the very slight possibilities of a driver overlooking signals under present conditions, and under certain conditions it is doubtful whether such arrangements would not introduce dangers on their own account. The whole problem is, indeed, one for practical railway officers to consider, the subsidiary aspects, which only those actually concerned can appreciate, being, perhaps, more important than the superficial and apparent factors. It cannot, however, be gainsaid that many accidents would be prevented by such appliances. At the same time it is not so certain that where signalling is in fault they would be equally commendable, even with track circuiting and direct control added to the cab-signalling equipment.

Gas Lighted Trains.

The fact that fire was added to the horrors of collision at Ais Gill has rendered the question of lighting vital. Ought it to be made compulsory upon railway companies to use only electricity for lighting railway trains? In itself this is a very serious proposition. If all stock has to be converted, a considerable time must elapse before gas disappears, while the expense to the railways must be enormous, bearing in mind the fact that, while many new coaches are being built, conversion is the only course for thousands of vehicles, the ages of which range from one to twenty years or more, and which require to be kept in traffic. It is not even sufficient to confine attention to express train vehicles, for it may be that a stopping, suburban or branch train will be the principal sufferer in the next train trouble to occur. Gas is also used in the kitchens of restaurant cars, and coal stoves are found in goods train brake vans. Danger may exist in connection with such lighting, though gas engineers can produce very convincing arguments that the danger is considerably magnified and is actually almost non-existent; but the question is, must the "exceptional possibility"—the million to one chance—rule the situation? Indeed, one may say that even if a gas-lighted train suffers in collision, it does not by any means follow that fire will ensue, or that there may

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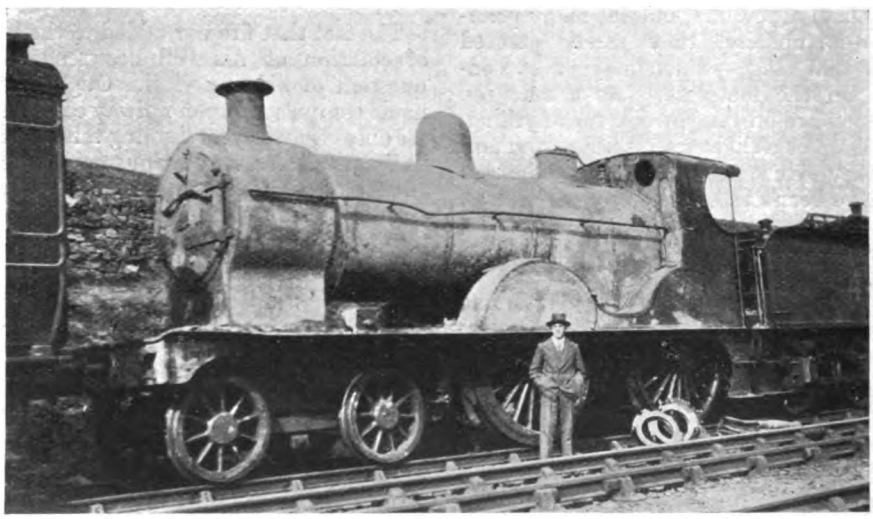
not be other factors equally or primarily contributory.

General Remarks.

As regards other aspects of this matter, we may remark upon the revival of many old ideas, *e.g.*, that buffer vehicles or empty carriages should be placed in front of and in rear of trains, and so on. All-steel vehicles are advocated, and there appears no serious reason why this practice should not be followed on steam as well as on electric railways. Most express trains now carry an equipment of tools, and some have first-aid cabinets. But it is unreasonable to expect every vehicle to be so supplied, while the inclusion of 10 ft. crowbars is surely a little beyond the limits of reasonable suggestion. There is much to be said for the display of flashlight or rocket signals if a train happens to be unexpectedly and unusually delayed; but here again opinions will always differ as to when they should be used and when dispensed with. Signalling, "train waiting" reminders to signalmen, and other arrangements are designed to give adequate safeguard and should, therefore, serve the same purpose, as also the placing of detonators and the going back of a guard along the line in the case of a delayed train. But in view of the usual contrariness of things, so many of these and other suggestions suffer from the drawback that when trouble does arise, it involves some factor which has never been taken into account. It must also be remembered that while human frailty exists—undoubtedly a factor to be reckoned with—its evidences are no more likely to occur than are failures in other directions. The natural tendency is to moralise when an accident has happened; but the difficulty of the practical railway man is to provide against every conceivable or inconceivable possibility, and yet to deal promptly with all the multifarious traffic conditions associated with each day's work. Too many safeguards will effectually "tie up everything in a knot." A reasonable compromise requires a little to be left to common sense and human agency, although it necessarily includes a very slight element of risk.



Photo] [*G. T. Rhodes.*

MIDLAND ENGINE NO. 446 AFTER THE COLLISION AND FIRE AT AIS GILL.

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PERTINENT PARAGRAPHS

A Woman Railway Crossing Keeper.

ABROAD women are often employed as crossing keepers, and occasionally have control of a small roadside signal cabin as well; but in this country there are only a few instances where level crossings are in charge of females. One is found on the Great Western Railway, at Leigh Wood crossing, Crowcombe, where Mrs. Hill has the distinction of being one of the few women concerned in traffic operations upon a British railway, and we are glad to be able to reproduce her photograph. When employed by the Great Western Company at Chard station, Mrs. Hill's husband met with a serious accident in 1880. He was transferred to Leigh Wood crossing, Crowcombe, in the famous hunting district of the Quantock Hills, so that he might the more speedily recover, but was never again fit for duty. His wife pluckily undertook his work on the line, and performed it so well that, ever since his death, which occurred in the following year, the company have allowed her to remain in charge of the crossing—an act of kindly consideration for which she is deeply grateful. Excluding "Specials," ten trains pass the crossing daily in each direction, and Mrs. Hill is never absent from her post. She has lived alone for thirteen years, all her children being married; but one of her daughters now resides with her husband near at hand, so that the faithful woman at the crossing has, as she tells the Editor of the RAILWAY MAGAZINE, "someone to speak to sometimes." The *Daily Telegraph* recently mentioned another English woman worker on the Great Western Railway. This is Mrs. Town, who is in charge of a small signal box situate midway between Brampton and Morebath, near the Somerset border of Devon. She has satisfactorily discharged the duties of her position for 23 years, and lives in a semi-detached cottage near the signal box, her daughter being her only companion. There are seven trains in each direction daily, except on Friday (market day), when the number is slightly increased. Mrs. Town is very proud of her work.

* * *

Herring Pickling at Fleetwood.

A NEW industry in connection with Fleetwood's prosperous fishing industry has been established, the *Manchester Guardian* announces, in the herring pickling business, which will deal with a portion of the big herring catches now being landed at Fleetwood. A total catch of three-quarters of a million was landed in one day early last month (September). To pickle the fish a

MRS. HILL AT HER CROSSING ON THE GREAT WESTERN RAILWAY.

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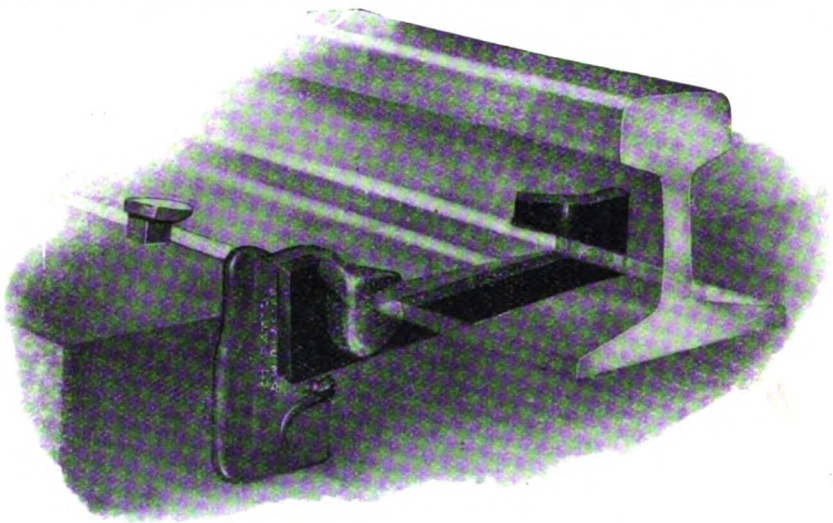
number of women have been brought from the Western Hebrides, and until a permanent place is ready for the business they are working in sheds near the fish dock. The herrings are pickled with salt obtained from the Fleetwood salt mines, and packed in barrels for export to America and the Continent. Readers of the RAILWAY MAGAZINE know that the Lancashire and Yorkshire Railway Company have at Fleetwood made admirable provision for every branch of traffic associated with the port, and we are glad to state that the returns for the summer season which was automatically closed on September 13th were more satisfactory than those of any previous year. The number of passengers travelling to and from Douglas, Fleetwood and Barrow showed a very substantial increase, and equally encouraging progress is recorded in respect of cargoes inwards and outwards. It is quite unnecessary for us to add that the Lancashire and Yorkshire Company, acting in hearty co-operation with the London and North Western, will give every facility needed for development of the new fish pickling industry.

* * *

Rail Creeping.

A PERMANENT-WAY problem which has become of pressing importance in late years is that connected with the "creeping" of rails. Its seriousness depends upon many factors, but primarily upon track conditions. On single lines, rail creep is frequently found to occur in each direction; and at points and switches, if not attended to, may become a source of danger, which will cause trouble in the signal installations. On bridges and trestles, and the approaches thereto, owing to vibration, the tendency for rails to "creep" is at times excessive. Rail creeping may also tend to push sleepers out of line, dragging them off the ballast, making low joints, and possibly causing tightness of gauge. Various contrivances have been introduced to overcome this serious difficulty, but the majority of these devices have failed when submitted to severe trial. It is obvious that such an appliance should be (1) simple, (2) easily fitted, and (3) not liable to cause trouble on its own account. The Vaughan Automatic Rail Anchor, illustrated on this page, manufactured and supplied by the Railway Track Supply Company (of Great Britain), 81, Gracechurch Street, London, E.C., is an effective remedy for rail creeping, and can be quickly applied by any track labourer. It is extremely simple in construction, and when once attached to the rail requires no re-adjustment or attention. It consists of two parts only, with means whereby loosening under vibration or reverse traffic is virtually impossible. The Vaughan Rail Anchor, therefore, strongly appeals to permanent way engineers in the British Dominions. The largest order ever placed for Rail Anchors was for specified 500,000 Vaughans. There are over 10,000,000 Rail Anchors of this type in use throughout the world, and we learn that their sale is rapidly increasing. This fact is sufficient to prove that the Vaughan Rail Anchor does what is required of it—actually prevents rail creep. In all cases where trials have been made with the Rail Anchor, the results have been most satisfactory. Many colonial and foreign railways have adopted the device on their roads, and its appearance on many others may be regarded as inevitable. Mr. J. D. Gillespie, the Managing Director of the Railway Track Supply Company (of Great Britain) has had many years' experience in the manufacture of rail anchors, and is an authority on the subject of rail creep. Holding the sole license to manufacture and sell the Vaughan Patent Rail Anchor in Great Britain, the Colonies, France, Belgium, Italy, Holland, and other countries, the company have issued a valuable booklet on "Rail



THE VAUGHAN "ANTI-CREEP" RAIL ANCHOR.

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Creep," and we are asked to state that copies of the same may be obtained upon application at 81, Gracechurch Street, E.C.

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Railway Station Architecture.

In our last issue reference was made to articles appearing in *The Architect and Contract Reporter* on the architecture of railway stations. The author, Mr. M. S. Briggs, points out that a marked advance in railway architecture was noticed during the first two years of Queen Victoria's reign. The great Doric portico at Euston was a fine specimen of the Greek Revival, being the work of Philip Hardwicke, who also designed the Central Hall. These buildings, he adds, display a trained architect's hand, and indicate the growing importance of the railway station. At the old Birmingham station, also opened in 1838, is a similar idea, the fine triumphal entrance screening the still ugly train shed, and surpassing Euston as a design. One of the most remarkable characteristics of the London and Birmingham, as of some other early railways, was the general excellence of that form of architecture which nowadays is classified as engineering—masonry, tunnel-arches, bridges, and retaining walls. "This country," says Mr. Briggs, "would possess many more such examples of sound building if architects and engineers understood the rudiments of each other's craft as thoroughly as did those first railway pioneers of 1838." St. Enoch's, Glasgow, closely followed the lines of St. Pancras, but was again extended in 1898, and is now much larger than its London prototype. Glasgow Central was built in 1879, and has also been greatly improved in recent years. Prince's Street station, Edinburgh, is a recent terminal, and was designed by Messrs. Peddie & Kinnear, of Edinburgh. The total cost was over £120,000, and the long low arcaded façade, with an angle pavilion at the principal corner, forms an admirable composition. In the two principal stations at Nottingham, also in the Midland stations at Leicester and Sheffield, may be seen examples of re-building necessitated by keen competition. All these are through stations, and in three cases out of the four the approach is from a bridge over the lines. This increases the difficulties of designing a monumental block of buildings, but nevertheless all are reasonably successful, the example at Nottingham (Midland) especially. The most important terminus in London, from an architectural or engineering point of view, at the present moment is Victoria, on the Brighton Railway, to which Mr. Briggs pays a very high and just compliment. He says:—"In the new Victoria may be seen the last word in English station design. Space, light, and brightness are its characteristics. The circulating area is more generous than in any London terminus. The booking hall is 120 ft. by 70 ft., and has 16 windows for tickets. Main line and suburban passengers are separated in a clear and unmistakeable way. Everything is in its place, and to get lost should be impossible. The underground lavatories are obvious without being obtrusive. The roof is constructed on the modern 'ridge and furrow' system in 50 ft. spans, with a height at the ridges of 64 ft., and is so arranged that the whole of the glass can be cleaned in a few days. The architecture of the façade has no dazzling features, and suggests a restraining hand on the architect who designed it. Yet it is by no means despicable, and its chief defect is the inevitable one of being cut in half, to a spectator, by the great glazed roof of the carriage shed. In the screen wall to Buckingham Palace Road, however, the architect has surpassed himself, and has, indeed, achieved a masterpiece. No such a treatment of a blank wall has ever been conceived since George Dance designed Newgate, and the Royal Arch at the northern end is true to the best traditions of Palladio and Sammicheli. The interior features of this station are chiefly carried out in dull green and white Doulton ware, a very appropriate medium for the purpose." Lastly, there is Waterloo, a new Colossus, which, when completed, will be the largest and one of the finest stations in the United Kingdom.

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Lubricating Locomotives.

The question has been asked why it should be necessary for drivers to go round their engines while running to attend to lubricators or for other purposes. A reader summarises the conditions as follows:—"It is something quite new to me that, in these days of mechanical lubrication, drivers should have to leave their cabs when in motion. It is all the more surprising when the object is, not to oil such parts as *may* not be able to get sufficient oil when the engine is being worked particularly hard, but to fill up the auxiliary boxes, which apparently are too small to admit of a non-stop run between Carlisle and Leeds. Surely these are not the methods adopted by British lines as a rule? In the case of engines using superheated steam it is customary to overcome the difficulty of lubrication of cylinders, etc., either by fitting a mechanical lubricator worked off the motion, or by arranging for a special jet of 'wet' steam to come into contact with the oil. In the latter case, does the steam merely 'displace' the oil in the tank, or does it conduct it to the cylinders through special pipes? And in cases where the lubricating arrangements are controlled by the regulators (as in Great Western Railway locomotives), how is cylinder lubrication provided for when running with steam shut off?" Speaking generally, we may state that the necessity for replenishing lubricators while running should be a special one; and, although some drivers may prefer to look round after running fast for a considerable time, it does not follow that they are obliged to do so. If, however, the lubricator is not working well, or the driver is doubtful whether it is supplying sufficient oil, he will, of course, go forward to satisfy himself or to attend to the lubricator, supplying further oil if required. The oil boxes should hold sufficient oil for all standard runs. Sight-feed lubricators are usually placed in the cab, and mechanical lubricators are also occasionally there, though as a rule they are located on the engine frame. If steam be used for supplying oil, the lubricant is usually conveyed by small pipes; but lubricators adjacent to the part to be lubricated are generally of syphon or other type, where mechanical apparatus is not installed. When running with steam shut off, it is generally arranged that a proportion of lubricant is supplied, even if the main supply be cut off.

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The Colchester Accident and the Release Key.

As reported in the newspapers, a distinct impression was conveyed that the fatal Colchester accident on July 12 was at least partially attributable to the non-provision of safety devices by the Great Eastern Company, and that Signalman Kerry was, therefore, harshly treated by the Directors, in that difficult and complicated traffic had to be worked with no more assistance than might be provided at an ordinary roadside station. Lieut.-Col. von Donop's report to the Board of Trade, however, makes it clear that this impression was erroneous, as, indeed, we knew it to be at an early date. Electric locking is, in fact, installed at Colchester on a relatively elaborate scale, based on the sequential operation of the respective signal levers, with the requirement that before one signal can again be lowered those in front must have been replaced and a rail contact actuated, to ensure that a second train cannot be signalled forward unless the first has duly passed all signals. The difficulty with such systems—which is largely shared by track-circuiting or other alternatives—is that an incomplete sequence of lever movements, as may be entailed by shunting within the limits of station control, involves the locking of the instruments and levers without unlocking by the completion of the required series. Therefore the release key is a necessity, while at busy centres its use is too frequent to allow of its being locked up behind a paper cover which has to be broken, as is sometimes done. Herein lies the difficulty. Such keys are provided for use at the discretion of the signalman; but in this case it was used incorrectly and without ascertaining that conditions justified its employment. That the release key is both a necessity and a weakness in station signalling is generally realised. A remedy, however, is not so simple as may appear. Too many safeguards complicate matters more than is desirable. Compromise is, therefore, necessary, with a degree of dependence upon the human element.

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Chased by a Locomotive Engine.

To be chased by a locomotive engine *off the track* is an experience which can have befallen very few; but an exciting episode of the kind is described in our Great Eastern contemporary, from the narrative of a platelayer's ganger. The incident occurred many years ago, the primary reason being the derailment of a goods train and the crashing into it the derailed wagons of another goods train on the other line where the relaying gang was at work. It seems that the ganger was so engrossed in watching the smashing-up process that any danger to himself escaped his notice, though his mates promptly effaced themselves. Almost too late he realised his own peril. "I had hardly got off the road," he says, "when the engine reached the place where I had been standing, and there the trucks, or fragments of them, which she had driven up in front of her, became too much for her to contend with any longer, and she jumped off the metals. Then, just as if she saw a chance to crush flesh and blood, instead of wood and iron, she turned sharply round and came down the batter—down which I had commenced to run—in my very footsteps, throwing the gravel and stones in front of her, as if to knock me down with them, and so prevent my escape, which was now uncertain enough in all truth. I made the best use of my legs I could. Run and jump, I should think I did, for unless I could get to the bottom and into the field beyond before she caught me, I knew it was all up with me. How I kept on my feet, I can't to this day make out, for the slope of the batter was as steep as a roof of a house; but I did so, and got to the bottom, where there was a post and a rail fence to get over. I bounded with one foot on the top rail of this, only to have it break under me and let me down on to the next. This, although it considerably checked, fortunately did not quite stop me, as the impetus I had gained in my rush down the batter precipitated me, toppling heels over head, a few feet into the field beyond. Luckily I fell well out of reach of the engine, which at the same moment stuck at the foot of the embankment."

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Train Submerged by a Flood.

An unprecedented episode is reported on the Pennsylvania Railroad system. The Muskingum, Wills Creek and Duck Creek Valleys, in south-eastern Ohio, were visited on Sunday evening, July 13, by an almost unprecedented rain and electrical storm, which continued unabated throughout the night. On the following morning a Pennsylvania Lines freight train of 19 cars reached a point about half a mile north of Stanleyville, where it was stopped by driftwood on the track. While the crew was working to remove the same, the rapidly rising water extinguished the fire in the engine. The train was later entirely submerged, and so strong did the current become that the caboose broke away from the rest of the train, and was pushed by the stream three-quarters of a mile without leaving the rails. Following was a passenger train of four cars. This ran through a little water over the tracks about a half-mile south of Stanleyville, and was held at that station by the flagman of the freight train. Learning of the difficulties ahead, the passenger train crew decided to back their train south to get on higher ground. The train was stopped to move a small tree which had lodged on the track, but while the crew were endeavouring to clear the obstruction, the stream was rising more rapidly, lodging and depositing driftwood between the trucks of cars. So much time was consumed in attempting to remove the *débris* that the fire in the passenger engine was drowned, as also was the fire in the engine of a third train, which in the meantime had left its cars and had come forward to render assistance. Some of the train men now went to get other help, and had exciting adventures. All of the men and one woman on the train had meantime been assisted to the roofs of the cars, and the other women passengers were taken through the coach windows before the water reached the seats. All the women were removed to the shore on the east side of the train before any of the men were rescued. By this time a farmer and his son arrived from the west shore with a boat, and their assistance was very timely. The train crew saved all the mail on the passenger train, some of the express matter, and the whole of the baggage except three trunks. Not long after the passengers had been removed from the train and the water had about

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reached the top of the cars, the old covered bridge which spanned Duck Creek at Stanleyville left its foundations, and floated broadside toward the front end of the passenger engine. It seemed certain that it would crash into the front end of the locomotive, but when a short distance away the end of the bridge struck a tree with sufficient force to veer the bridge away. The end of the bridge just touched and broke off the headlight of the engine. These particulars are extracted from an account of the occurrence officially supplied to the RAILWAY MAGAZINE by the Pennsylvania Railroad Company, whose superior officers have highly commended Conductors Davis and Sweeney in recognition of their "prompt and intelligent action" during the flood. A cheque has also been sent to the farmers who rendered valuable assistance.

* * *

A Favoured Railway.

THE *Stratford-on-Avon Herald*, in commendation of the conditions prevailing on the Stratford-upon-Avon and Midland Junction Railway, says:—"Our little local railway—the S. M. J.—occupies a unique position. It enjoys the blessing of having no Sunday trains, and that day is free to the men to spend in the manner which best accords with their individual tastes. They have one real red-letter day in the year, which owes its existence to the generosity of the directors and the kindness of Lord Willoughby de Broke. Small as the line is, a special interest is evinced in the workers. Prizes are awarded for the best-kept and most attractive railway stations, and also for the best-maintained portions of the line. Of course, these awards give rise to some amount of rivalry, a feeling which railway companies can encourage with advantage. But the directors' generosity does not stop here. They set apart one Sunday in the year for an outing, and they are enabled to make arrangements for this taking place in one of the loveliest parts of Warwickshire. The company numbers among its directors Lord Willoughby de Broke, who unselfishly places his lovely seat at Compton Verney at the disposal of the staff. Thus the enjoyment of the outing is greatly enhanced, and that the privilege is appreciated is shown by the men in the course of the afternoon's proceedings. A bountiful tea is provided on the lawn adjoining the house—this having a glorious setting of noble trees scarcely to be rivalled in any part of Warwickshire—the services of a fine band are secured to discourse the best of music, and the speaking is limited to a few words, all interesting to the men, inasmuch as they convey to them the directors' appreciation of their services. It is not often that such spontaneous praise is bestowed, and from what transpired the only conclusion to be drawn is that no happier band of directors and men is to be found on any line in the kingdom. It is this concern for each other's interest which must tend more than anything else to prevent those unhappy disputes which so often paralyse the trade of the country."

Second-Class Passengers on First and Third-Class Railways.

ALTHOUGH many railways now convey only first and third-class passengers, official statistics in several cases include a number of second-class travellers. This fact has evidently puzzled some of our readers. In regard to specific instances the following explanation may be offered. During 1912 the Metropolitan Railway Company records 72,450 second-class passengers as travelling over their lines, although they do not run any second-class trains. The apparent discrepancy is, of course, due to the fact that the Great Northern and South Eastern and Chatham trains which use the "widened" lines between Moorgate Street and King's Cross stations provide second-class accommodation. These lines are Metropolitan property. That company therefore shares in the receipts, and counts the passengers among its own. Similarly the Great Western "second-class" passengers represent that branch of traffic on sections which are joint with the London and South Western and other companies that still provide three classes of accommodation.

* * *

Improvements at Paddington.

PADDINGTON station, as enlarged and provided with "tube" connection, will be an exceedingly well equipped terminus of the most approved type. There will be ten platforms, and two milk docks on the arrival side, with the present "A" excursion platform on the departure side. Below platforms 9 and 10 will be the booking hall of the London Electric Railway, entrance thereto being given from various parts of the station, while escalators will facilitate access to the underground station. Under platforms 4 and 5 will be a lift to the authorised post office rail subway. Combined with the existing connections at Praed Street and Bishops Road stations, Paddington will then be well supplied with inter-change facilities. A drawing showing "Paddington as it will be" is published in the Great Western Company's magazine.

* * *

Sir Myles Fenton.

MANY congratulations have reached Sir Myles Fenton on the attainment of his eighty-third year. He is, we believe, the oldest officer living holding high position on an English railway, for he is still consulting director of the South Eastern and Chatham. His railway career began 68 years ago, when he started work on the Kendal and Windermere line, and he rose to become general manager of the Metropolitan and South Eastern, long before the amalgamation of the latter with the Chatham Company. His natural placidity of character has had a wonderful effect in preserving the excellent health which he has invariably enjoyed, and he is to-day one of the most venerated figures in British railway life.

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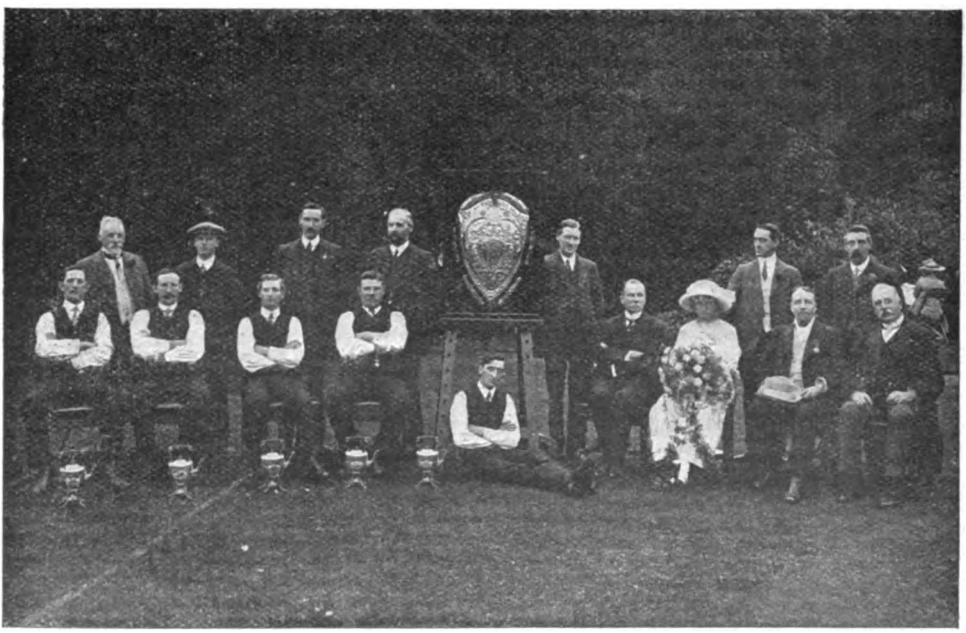
THE twelfth annual ambulance competitions in connection with the Furness Railway took place this year in the picturesque grounds of the Furness Abbey Hotel, which were described in the July RAILWAY MAGAZINE. Invited to witness the proceedings were many of the leading residents of Barrow and the district, and keen trials were witnessed. Five teams of the company's servants took part—Barrow, Ulverston, Millom, Moor Row, and Whitehaven. Major G. H. Darwin, M.D., V.D., of Southport, who has for several years acted as judge, again officiated, and his awards, which were as follow, gave general satisfaction :—

1, Moor Row, 118 marks.
2, Millom, 112½ ,,
3, Barrow, 108 ,,
4, Ulverston, 96½ ,,
5, Whitehaven, 90½ ,,

Moor Row were successful in winning the shield last year, and Mr. F. J. Ramsden, who presided, in presenting the shield to Mr. I. Lowery (captain), heartily congratulated him on their achievement. The members of the first three teams were :—Moor Row : I. Lowery (captain), W. McCallum, S. Croasdell, W. Martin, W. Quayle, and T. Stephens (reserve). Millom : J. Lowery (captain), H. Oldfield, J. Moyle, J. Atkinson, F. Tyson, and W. Lewis (reserve). Barrow : W. J. Tyson (captain), W. Stringer, S. Rigg, R. Blundell, J. Uren, and J. Hornby (reserve). Silver kettles were handed to the members of the first team, cases of fish knives and forks to the men in the second, and butter dishes and knives to those in the third. Mr. John Hope, who has been secretary of the ambulance centre since 1907, also received a silver mounted ebony walking stick, the gift of the members of the team who won the ambulance shield in the general competition which took place in London



ST. JOHN AMBULANCE ASSOCIATION—FURNESS RAILWAY CENTRE. COMPETITION FOR DIRECTORS' CHALLENGE SHIELD AT FURNESS ABBEY, WEDNESDAY, AUGUST 27TH, 1913.
WINNERS—MOOR ROW TEAM.

Back Row—left to right: Mr. Postlethwaite, Mr. G. Postlethwaite, Mr. T. Stephens (Reserve). Mr. J. Shaw, Mr. G. Dickinson, Mr. J. Hope, Dr. Byers. Middle Row: W. Quayle, Mr. I. Lowery (Capt.), S. Croasdale, W. McCallum, Mr. F. J. Ramsden, Mayoress of Barrow (Miss Bradshaw), Mr. A. Aslett, Major G. H. Darwin. Front Row. W. Martin.

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last May. In the course of the proceedings, testimony was borne both by the Chairman and by Major Darwin to the great interest which the employés of the Furness Railway evince in ambulance work. Mr. Ramsden stated that since the centre was formed in 1902, the members had obtained from the St. John Ambulance Association 468 first year examination certificates, 268 re-examination vouchers, 229 third examination medallions, and 451 fourth and following examination silver labels. They had attended to no fewer than 240 cases of accident to the public and their fellow men during the past twelve months. The Furness Railway team again took part in the Inter-Railway Competition in May last, and the men were to be congratulated on their splendid performance in winning the shield, having regard to the fact that 26 of the best ambulance teams in England and Wales took part in that competition. The Moor Row (London and North Western and Furness Joint Line) team took part in the competition, and again improved their position by securing the 16th position as compared with the 18th the year previous. The Moor Row team also took part in a competition at Carlisle on August Bank Holiday, and won a cup and prizes. (Applause.) To commemorate the great victory by the Furness Railway team each member, together with the reserve man and the late captain, had been presented by the directors with a cheque for £5, in addition to the prize they received from the St. John Ambulance Association. Mr. Alfred Aslett, the Secretary and General Manager of the Furness Railway, proposed a vote of thanks to Mr. Ramsden for presiding, and announced that the Duke of Devonshire, the chairman of the company, sent his personal congratulations to the Furness Railway men on the great success which they achieved in London.

* * *

ALONE among British companies the directors of the Wirral Railway have issued a half-yearly report in the form now prescribed by Act of Parliament for annual publication, and the usual half-yearly meeting was held at the General Offices, New Brighton station, on Thursday, August 28. Mr. Thos. H. Jackson (Chairman of the Directors) who presided, stated that whereas the railway companies throughout the country have adopted the arrangement to issue yearly instead of half-yearly statements of accounts, and to hold their shareholders' meetings annually he and his colleagues decided not to follow that course. The earnings of the Wirral Railway in 1912 were £32,983, and comparing with 1911, are better by £917. First-class passenger receipts, while the numbers were slightly less, realised more money, resulting from longer journeys, while the third-class remained practically stationary. A substantial increase in receipts resulted from season ticket business. Parcels and goods traffic and other sources of revenue all showed increases, parcels traffic being up £123, whilst goods traffic increased £370. Coal traffic for shipment showed a very large decrease. This arose owing to goods traffic taking the place of coal as cargo. There was a large increase in maintenance of permanent way, due to new rails and other material, the additional cost in the locomotive department for the purchase of an engine, the extensive repair and replacement of boilers, and other work. The increase in traffic expenses was attributable to the re-arrangement of duties consequent upon the settlement entailing the employment of more men, and the increase of wages agreed at the same time. There are obligations also under the National Insurance Act and the Superannuation Fund, which cost in the aggregate a considerable sum of money. The Directors were satisfied with the progress of the railway, and while regretting the very heavy expenditure debited to revenue during the half-year, they are determined to keep the railway up to the highest point of safety and efficiency.

* * *

THE fourth annual report of the Cape Town Railway Institute, records a good year's work. In July, 1909, as a result of a petition signed by over 300 of the staff, and presented to the General Manager, the Institute, having for its object the promotion of social and literary advantages among railway men, was formed. Shortly afterwards, the various railway sporting bodies affiliated themselves to the Institute, and athletics have since become a prominent feature of its operations. At the same time, classes were commenced for instruction in station accounts, shorthand and typewriting, Dutch, and ambulance work; in addition to which, a course of lectures on trains crossing and telegraphy was given during the first part of the present calendar year. Classes for the educational improvement of those in the service are also held, and the Institute Committee is now recognised by the Cape District School Board as the controlling body of the railway night school. This school was originally started for white labourers, but is now attended by messengers and others, whose circumstances were such as to necessitate their leaving school before passing the seventh Standard. The premises now occupied were given by the Administration rent free, but were always regarded as temporary, until such time as a suitable building could be erected. Considerable difficulty was experienced in obtaining a site conveniently central for all sections of the staff, and it was with great satisfaction that the committee heard of the General Manager's decision to recommend that on which the old bond store stands in the goods yard. The Railway Board, on being approached, met the members in a very generous spirit, and, of the £11,000 estimated as necessary to cover the cost of building and furnishing an up-to-date Institute, gave £7,000 as a free grant, authorising the balance as a loan at 6 per cent., which includes interest and cost of maintaining the building.

* * *

THE Photochrom Company, Limited, of London and Tunbridge Wells, have issued a charming souvenir entitled "London To-day," consisting of 50 copyright phototypes, with descriptive letterpress, and a corresponding number of "thumb-nail" sketches by Mr. Thomas Downey. Strictly limited in the output of copies, this edition de luxe, bound in red morocco, reproduces, in highly artistic outline, all the characteristic features of London as it is seen by the present generation, and consequently possesses rare historical value.

Richard Le Gallienne truly wrote:—

"Oh London! London! our delight,
Great flower that opens but at night,
Great city of the midnight sun
Whose day begins when day is done."

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But "London To-day" does much more than reveal the great metropolis in its pleasure aspect. It gives us striking pictures of Westminster Abbey, St. Paul's Cathedral, the Houses of Parliament, the Tower (with separate phototypes of the Traitor's Gate and the White Tower), the new Central Criminal Court, the Law Courts, Somerset House, Pump Court, Staple Inn, the Temple, the Victoria Embankment and other well-known modern thoroughfares and public buildings, including the Admiralty Arch, Westminster Cathedral, Buckingham Palace as it appeared before the exterior improvements now in hand had been begun, the National Memorial to Queen Victoria, various Government Offices, and several public gardens—the whole production being extremely interesting.

* * *

FOR the convenience of visitors to Bournemouth and the district, the London and South Western Railway Company now issue "Holiday Season Tickets," which afford unlimited scope for the visitor to cover the whole of that delightful holiday field, travelling as often as he may wish during the time for which the ticket is taken, the cost being, for one week from 5s., fortnight from 8s. 6d., and for a month from 11s. 3d. With a Bournemouth holiday season ticket, the golfer has the choice of nine excellent courses; the angler four rivers and numerous fishing-grounds; the yachtsman various anchorages in the harbours; the rambler the forests and fields of Hampshire, and hills and dales of Dorset. There are eight pleasant coast resorts in the vicinity, to say nothing of the hundred and one other delights in the charming scenery, wonderful chines, extensive woods, also places of archæological, historic and literary associations, as Wimborne and its Minster, Christchurch and the Priory Church, Beaulieu Abbey, the New Forest, Corfe Castle. These "holiday seasons" are issued to first, second and third class ticket passengers.

* * *

THE *Pall Mall Gazette* understands that next session the President of the Board of Trade will invite the House of Commons to take further action with a view to prevent strikes and lock-outs on railways. Our contemporary says:—"During the past few years, in the House of Commons and elsewhere, appeals have been made to the Government to endeavour by Commission or Committee to arrive at a more clear definition of the relations between the State and the railways of the country, both as regards directors and employees, to a view of preventing if possible, the recurrence of the strikes and lock-outs which have proved so disastrous to the trade, commerce, and industry of the nation. The appeal for such an inquiry have not been confined to any particular section of the community, and railway directors and railway employees have shown no disposition to resent such action. Although no definite confirmation is obtainable, it is believed that Mr. Buxton has already communicated with certain of the great railway companies on the matter, and the recess may be occupied in preparing a scheme for submission to Parliament when it reassembles. In certain responsible quarters it is hinted that if once such an inquiry is commenced it may lead to the opening up of questions of supreme importance, questions directly affecting the future position of the railways of the country towards the State."

* * *

A PROGRAMME of lectures and classes on railway and cognate subjects is announced by the London School of Economics and Political Science (University of London), Portugal Street, Kingsway, E.C. Sir Charles J. Owens is Chairman of the Committee of Governors on railway subjects, and other members of the committee include: Mr. Acworth, Mr. F. H. Dent (South Eastern and Chatham Railway), Sir Sam Fay (Great Central Railway), Sir George Gibb (Chairman of the Road Board), Mr. F. Potter (Great Western Railway), and Mr. H. A. Walker (London and South Western Railway). Among the railway lectures for the session commencing Monday, October 6, are "Railway Work in India," Mr. G. C. Godfrey; "Railway Organisation," Mr. E. C. Cleveland-Stevens, M.A.; "The Geography of European Railways," Professor A. J. Sargent, M.A.; "Railway Rates and Fares," Mr. W. Tetley Stephenson, B.A.; "The History of English Railways," Mr. E. C. Cleveland-Stevens, M.A.; "Railway Economics—Operating, Commercial, Construction and Locomotive Operation," Mr. W. Tetley Stephenson, B.A.; "The Law of Carriage by Railway," Mr. H. W. Disney, B.A.; and "The Law of the Traffic Relations of Railways to other Railways and the Public," Mr. Arthur Moon, B.A.

* * *

HALF a century ago one of the principal yet little known branches of the Great Eastern Railway was opened for traffic between Ware, Hadham and Buntingford, and passenger trains ran thereon for the first time on July 3, 1863. As a writer in the *Great Eastern Railway Magazine* points out, three passenger trains each way sufficed at that time, but now there are altogether 20, 9 up and 11 down, as well as a morning and afternoon goods—up and down—with an average of 25 trucks to each. There are two passing stations, Hadham and Braughing. During the 50 years, there has not been any really serious accident—no life has been lost (except in one or two cases of suicide). The worst thing that ever happened was the snowing up of the last train in the great blizzard of January, 1881, when the passengers had to remain in the train all night.

* * *

THE total length of railways in Mexico is now 12,862 miles, or 15,870 miles, if local lines under State control be added. Concessions have this year been granted for the following new railways: (1) from Higo, in the State of Vera Cruz, to Tampico; (2) from Tampico to La Barra, at the mouth of the Pánuco River; (3) from Ixtla to Cocoyotla; (4) from Miacatlan, in the State of Morelos, to the Caves of Cacahuamilpa. By the National Railways eight other lines are being constructed—(1) Durango-Canitas, (2) Durango-Flano Grande, (3) Penjamo-Ajuno, (4) San Andres Tuxtla branch of the Vera Cruz and Istmus, (5) Cerro Colorado branch of the same railway, (6) Vera Cruz-Tampico, (7) Tampico-Matamoros, (8) Allende-Las Vacas. The rebels lately succeeded in destroying over 3,000 miles of track, the greater portion of which was State property.

* * *

THE Great Western Railway continues to find much useful work for its smaller passenger

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locomotives of the 2–4–0 type. One of the old class, known as the "England" series, of a design similar to the illustration in Vol. V. of the RAILWAY MAGAZINE (page 322), but with a raised round-topped fire-box, of a pattern long superseded by Belpaire design in Great Western practice, is now on regular service in the Bristol district. No. 2601, built in 1899 as a 4–6–0 goods engine, with inside cylinders, outside frames and bearings to the coupled wheels, and the sand-box on the boiler barrel, is running rebuilt to conform with the "Aberdare" class of 2–6–0 engines. The standard coned boiler, with top feed, is fitted, and the sand-boxes occupy the usual position in British practice. In her original state, No. 2601 was illustrated on page 298, Vol. IX. of the RAILWAY MAGAZINE. Further 2–6–0 outside cylinder mixed traffic locomotives (4300 class), are being constructed at Swindon.

* * *

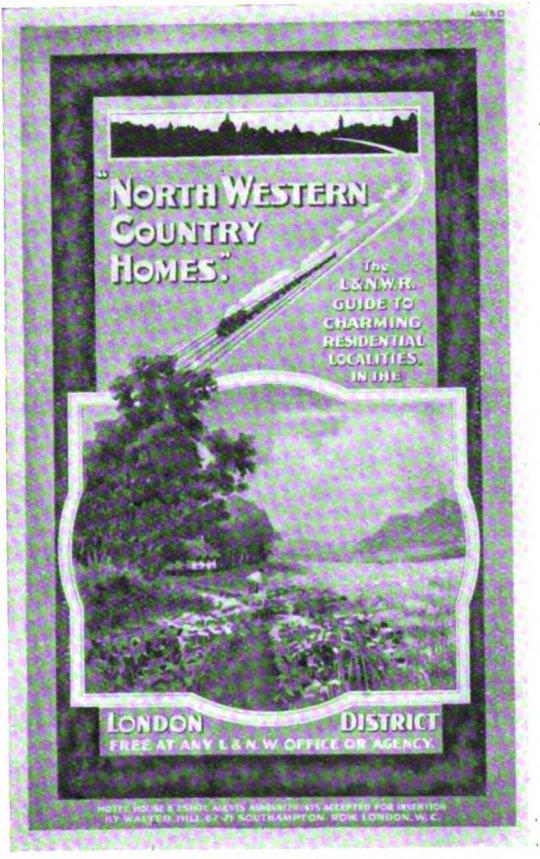
INTERESTING papers will be read during the 1913–4 session of the Railway Club. On Tuesday, September 16, Mr. B. M. Bazley read a paper on "Characteristics of our Chief Railways." The President, Rev. W. J. Scott, will deal with "The History of the Great Central Railway" on October 14. On November 11, Mr. A. W. Bartlett will describe the Somerset and Dorset Railway. On December 9 there will be an exhibition of the large selection of lantern slides owned by the Railway Club, the lecturer being Mr. H. L. Hopwood. And on January 13 Mr. M. G. S. Blane will deliver an address (illustrated by lantern views) on "The Light Railways of France." Further particulars, as also of membership, will be furnished by the Hon. Secretary, Mr. E. J. Miller, at the offices of the Railway Club, 92, Victoria Street, Westminster, London, S.W. The Duke of Zaragoza, a well known authority on railway and locomotive matters, has accepted a Vice-Presidency of the Club.

* * *

THE illustration of a railway tunnel shown on page 237 and on the front cover of our last issue has attracted considerable attention, judging from the variety of locations suggested. Accurate replies were received from Mr. G. Milne, of Mossley Hill, Liverpool, and Mr. K. Smith, of Mossley, near Manchester. It is Mossley (Scout) Tunnel, on the Huddersfield-Manchester section of the London and North Western Railway. Various incorrect suggestions to our query included: Box tunnel, Great Western Railway; Watford Old Tunnel, London and North Western Railway; the tunnel between Dove Holes and Chapel-en-le-Frith; Prestbury Tunnel, near Macclesfield, London and North Western Railway; and Shugborough Tunnel, London and North Western Railway.

* * *

AIR compressors, vacuum and water pumps of the well-known Westinghouse type, form the subject of a brochure issued by the Westinghouse Brake Co., Ltd., of 82, York Road, King's Cross. The characteristic pattern associated with railway brakes is adopted, simple or compound, two stage or three stage, for many industrial purposes. For boiler feeding they are adaptable for locomotive use, and in this form are to be found on several railways where engines are fitted with condensing apparatus, but they are equally applicable for general boiler feeding. Vacuum can be produced by reversing the connections.


"NORTH WESTERN COUNTRY HOMES."
THE L&N.W.R. GUIDE TO CHARMING RESIDENTIAL LOCALITIES IN THE
LONDON DISTRICT
FREE AT ANY L & N.W. OFFICE OR AGENCY.

ART AT EUSTON.

There are many other purposes for which Westinghouse compressors and pumps are available, while the compact nature and convenience of the design render it very suitable for use in difficult and awkward locations.

* * *

THE September number of the *London and North Western Gazette* contains articles on the centenary of the Locomotive Engine, in this case Blackett and Hedley's "Puffing Billy"; and the Shrewsbury-Swansea route taken by London and North Western trains, the latter including particulars and pictures of the Swansea and Mumbles Railway in 1840, 1865, and the present day. Among other items mention may be made of an illustration of Mr. C. W. Bartholomew's private railway and train at Blakesley Hall, Towcester (where the third annual competition between the Southern and Rugby districts for the Bartholomew Challenge Shield was held, Camden Goods coming first, Castlethorpe second, and Broad Street third), and a goliath crane at Aston.

* * *

THE "Railophone" inductive system of train telephony, telegraphy, and direct control, was described in the RAILWAY MAGAZINE, August, 1912. A pamphlet has just been issued by International Railophones, Limited, of Prudential Buildings, Corporation Street, Birmingham, giving particulars of five methods of applying

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this system to practical railway operation. A "Railophone" plant has recently been ordered by the German Imperial State Railways, and given a test on one of their lines near Berlin, with such successful results that the Minister for Railways, who personally inspected the plant, has since placed an order for an extension (10 times the length of the original trial plant). This extension is now being laid down.

* * *

MR. HUISH WOOD, who was in the employment of the Lancashire and Yorkshire Railway Company for 54 years—43 years as stationmaster—is now enjoying well-earned retirement on a superannuation allowance. He worked first on a farm near Huddersfield, then in a mill, and afterwards at a colliery, but at the age of 11 entered the service of the Lancashire and Yorkshire Company at Denby Dale station. Transfer from one station to another was accompanied by promotion, and as he earnestly studied office routine at the close of his ordinary day's labour, was eventually appointed stationmaster at Thongs Bridge, near Holmfirth. Later, placed in charge at Darton, near Barnsley; he next went to Greetland and North Dean, near Halifax. There he remained for 21 years, and his official career came to a close at Rose Grove, near Burnley, where he acted as stationmaster for over 17 years. In a modest narrative of his experiences, Mr. Wood says:—"In those early times service on the Lancashire and Yorkshire Railway was not what it is to-day. We had neither sufficient engines, carriages and wagons to deal with the traffic, and had to make use of cattle wagons to remove passengers in summer. At the time of the Sheffield Flood we had to load box wagons to convey passengers, and several returned without hats, having lost them on the way." He is thankful that he was brought up with strict stationmasters, that being the reason of his success on the railway.

* * *

MR. JAMES FEIRON has recently retired after more than half-a-century of railway work. His first association was with the Great Northern Company. This lasted for eight years, and he then joined the Metropolitan Railway, with which he has been connected for exactly 44 years. He has rendered excellent service to that system as manager of its publicity and advertising department, and his efforts have undoubtedly contributed largely to the success which the line has enjoyed, especially since bold advertising came to be recognised as an essential feature in efficient railway management. In Mr. Alec Feiron, the advertising manager of the London and North Western, and the son of Mr. Feiron, we have another singularly able exponent of the same art, and to the latter the public owe some of the most attractive features in publicity of which any railway in this country can boast.

* * *

THE Lancashire and Yorkshire Railway Mechanics Institute and Technical School, was reopened for the winter session on Monday, September 22. In the programme of classes and lectures prepared by Mr. J. T. Tatlow, Honorary Secretary, the subjects taught include Machine Drawing and Construction, Mechanical and Electrical Engineering, Applied Mathematics, Chemistry, Geometry, Boilermakers' work, as well as Shorthand, German, French, Bookkeeping, Commercial, English and Business Methods, and with Millinery and Cooking on the female side. The Institute is supported largely by the Lancashire and Yorkshire Railway Company and by its Directors and chief officers. A number of special prizes are offered to encourage students.

* * *

MR. R. M. URIE, Chief Mechanical Engineer, London and South Western Railway, is constructing a series of 4–6–0 two-cylinder locomotives for mixed traffic. They will have 6 ft. coupled wheels, outside cylinders, 21 in. by 28 in., and steam pressure 180 lbs. per sq. in. The engines will be fitted with Walschaert valve gear. Four will have Robinson and four Schmidt superheaters, while two will run with saturated steam. The tenders, although of the 8-wheel type, will not be fitted with bogies as hitherto, and will have a capacity of 5,200 gallons.

* * *

THE London and North Western Railway announces an improved service between Liverpool (Lime Street) and Ireland. A new train in connection with the Irish mail steamer leaving Holyhead at 2.25 a.m., and arriving Kingstown Pier at 5.30 a.m., will leave Liverpool (Lime Street) for Holyhead at 11.10 p.m. (week-day), arriving Holyhead station at 1.53 a.m., and Holyhead Pier at 2.2 a.m. A through carriage for Liverpool (Lime Street) will be attached to the up night Irish mail leaving Holyhead at 12.22 a.m.

* * *

WE are informed that Mr. Lindsay and Mr. Patterson, two of the victims of the Ais Gill disaster, purchased Railway Passengers Assurance Company's tickets before starting in the train to which the accident at Ais Gill occurred, and that the dependents of each will be paid the sum of £1,000 as soon as possible after the necessary arrangements have been completed. This Company has also received several claims from those who were injured on the same occasion.

* * *

The Haslemere and Hindhead Gazette, issued by Mr. Harry J. R. Oliver, of Haslemere, is a useful little publication, affording a guide to the Haslemere and Hindhead districts, where to stay, what to see, with maps and illustrations. Mr. Oliver, who is in the service of the London and South Western Railway Company at Haslemere station, started the book as a four-page leaflet, but it is now a handy little volume of 108 pages, with an annual circulation of 4,000. The founder and editor of the guide also organises dances and social functions in the winter, and motor trips round the district in the summer.

* * *

"SOME French Railway Services and Locomotive Performances" is the subject of a paper to be read by Mr. G. F. Burtt before the members of the Institution of Locomotive Engineers on Friday, October 3, at Caxton Hall, Westminster. On October 31 Mr. J. Bennett will give the second part of his paper on "Locomotive Boiler Examination, Defects and Repairs." Further particulars may be had from the Secretary, Mr. G. F. Burtt, 46, Malling Street, Lewes.

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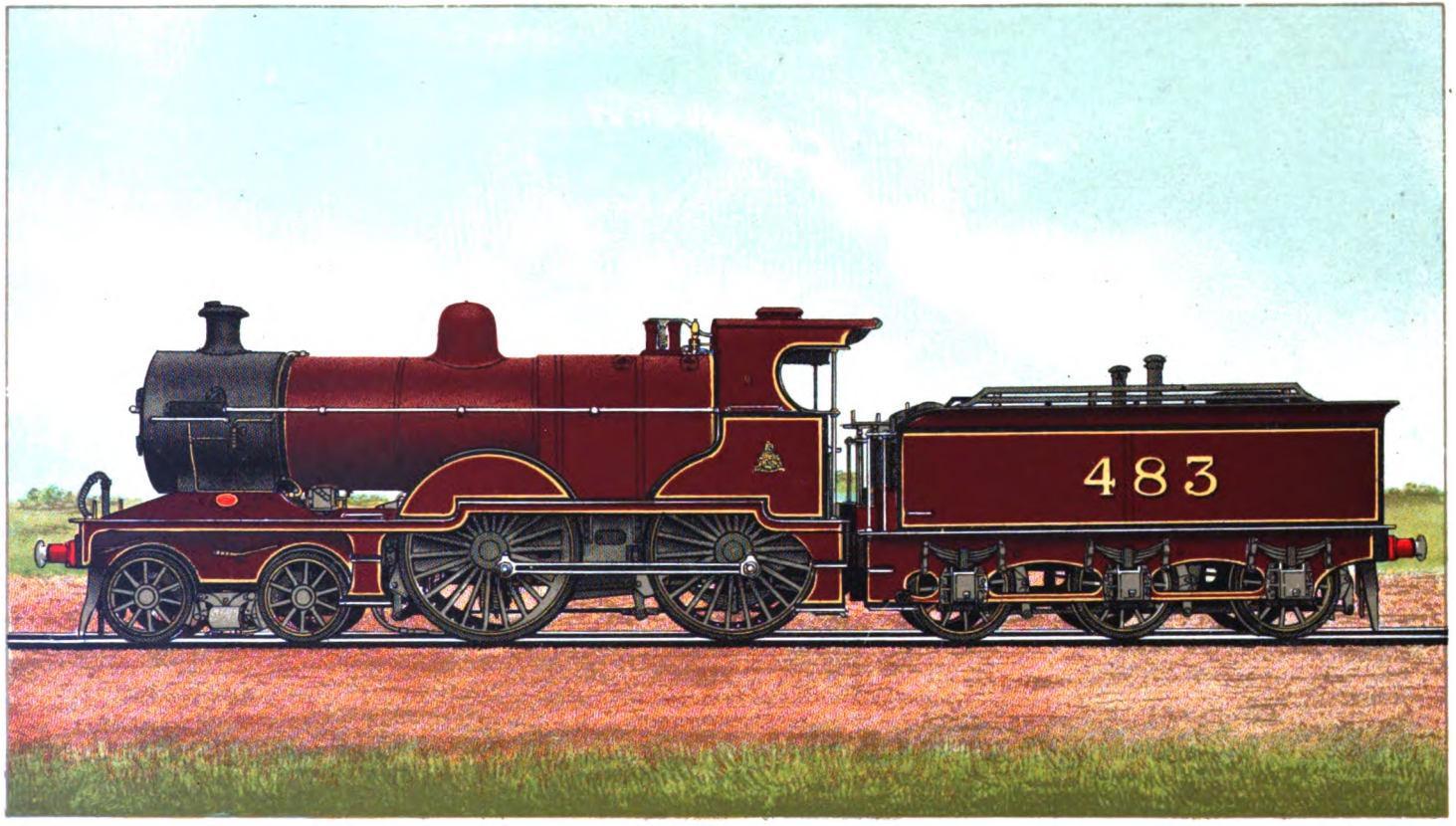

A. Cooke Ltd. Leeds

MIDLAND RAILWAY RE-BUILT FOUR-COUPLED EXPRESS LOCOMOTIVE, No. 483.

FITTED WITH SCHMIDT SUPERHEATER. MR. H. FOWLER, CHIEF MECHANICAL ENGINEER.

CYLINDERS, 20½IN DIAMETER, 26IN. STROKE. DIAMETER OF COUPLED WHEELS, 7FT. 0½IN. STEAM PRESSURE, 160LBS. PER SQ. IN.

TOTAL HEATING SURFACE, 1485 SQ. FT. GRATE AREA, 21·1 SQ. FT.

WEIGHT OF ENGINE IN WORKING ORDER, 53 TONS 7 CWTS. ENGINE AND TENDER, 93 TONS 4 CWTS.

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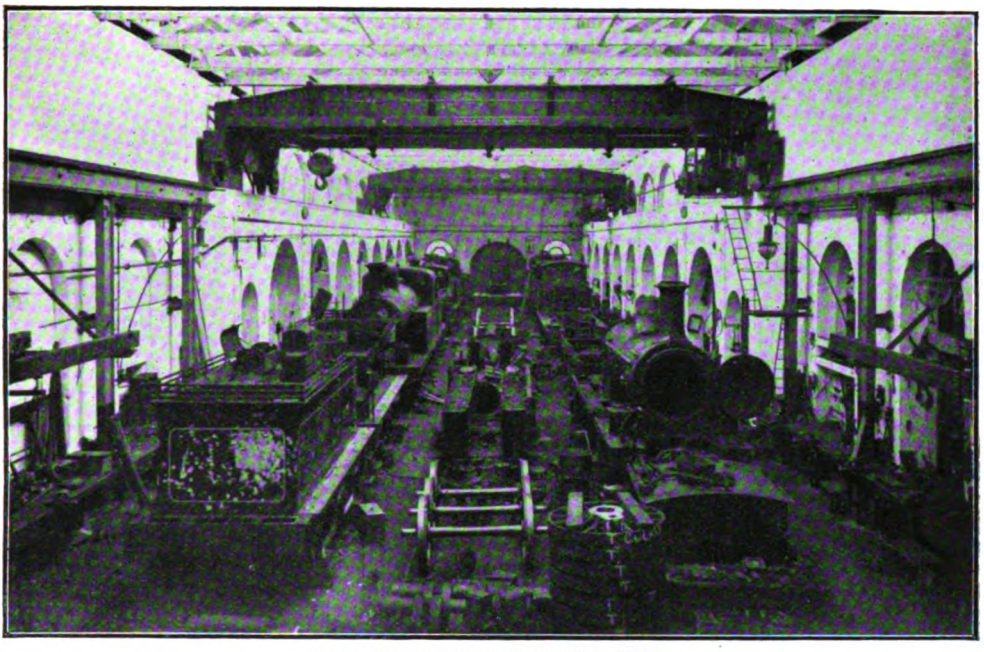

EAST END OF THE ERECTING SHOP.

Stoke Works: North Staffordshire Railway.

By J. F. GAIRNS.

THERE are few railways of equal importance which are less known outside the areas served directly by them than the North Staffordshire. This is partly explained by the fact that it is surrounded by greater systems in so remarkable a fashion that unless one requires to penetrate to the central district thus formed it is easily possible almost to overlook its existence. Thus, in the south it joins the London and North Western at the roadside stations of Norton Bridge and Colwich; in the south-east it connects with the Great Northern and Midland lines towards Nottingham in the one case and Derby in the other. At Ashbourne on the east it connects again with the London and North Western, and in the north, at Macclesfield, junction is made with the London and North Western to Stockport, and by means of the North Staffordshire and Great Central Joint line to Romiley with the Great Central system. Westwards other connections are made with the London and North Western at Crewe and Sandbach, and with the Great Western at Market Drayton. The system is, therefore, hemmed in, as it were, by its greater neighbours, providing access to its own peculiar area—the Potteries—from several important stations—Stafford, Crewe, Derby, Egginton Junction and Macclesfield—but itself constituting in effect a magnified local system of railways whose value and traffic are only realised when the North Staffordshire line is itself visited.

Yet the North Staffordshire Railway is by no means an insignificant concern. Its capital exceeds £11,000,000; the receipts for the twelve months ending December 31st, 1912, amounted to £1,063,610, and the expenditure to £662,891; the dividend on the ordinary stock was 4⅜ per cent. per annum; 6,700,297 passengers were conveyed during the same period, excluding season ticket holders; train mileage amounted to 2,883,268; the track mileage is 226½, and the enormous proportionate foreign mileage of 382 is worked over by North Staffordshire trains and engines; and there are 188 locomotives, 420 passenger train vehicles and 6,463 goods vehicles of various kinds. These figures do not suggest a small second-rate system; and in its own area the North Staffordshire is, in fact, a very important factor, for goods

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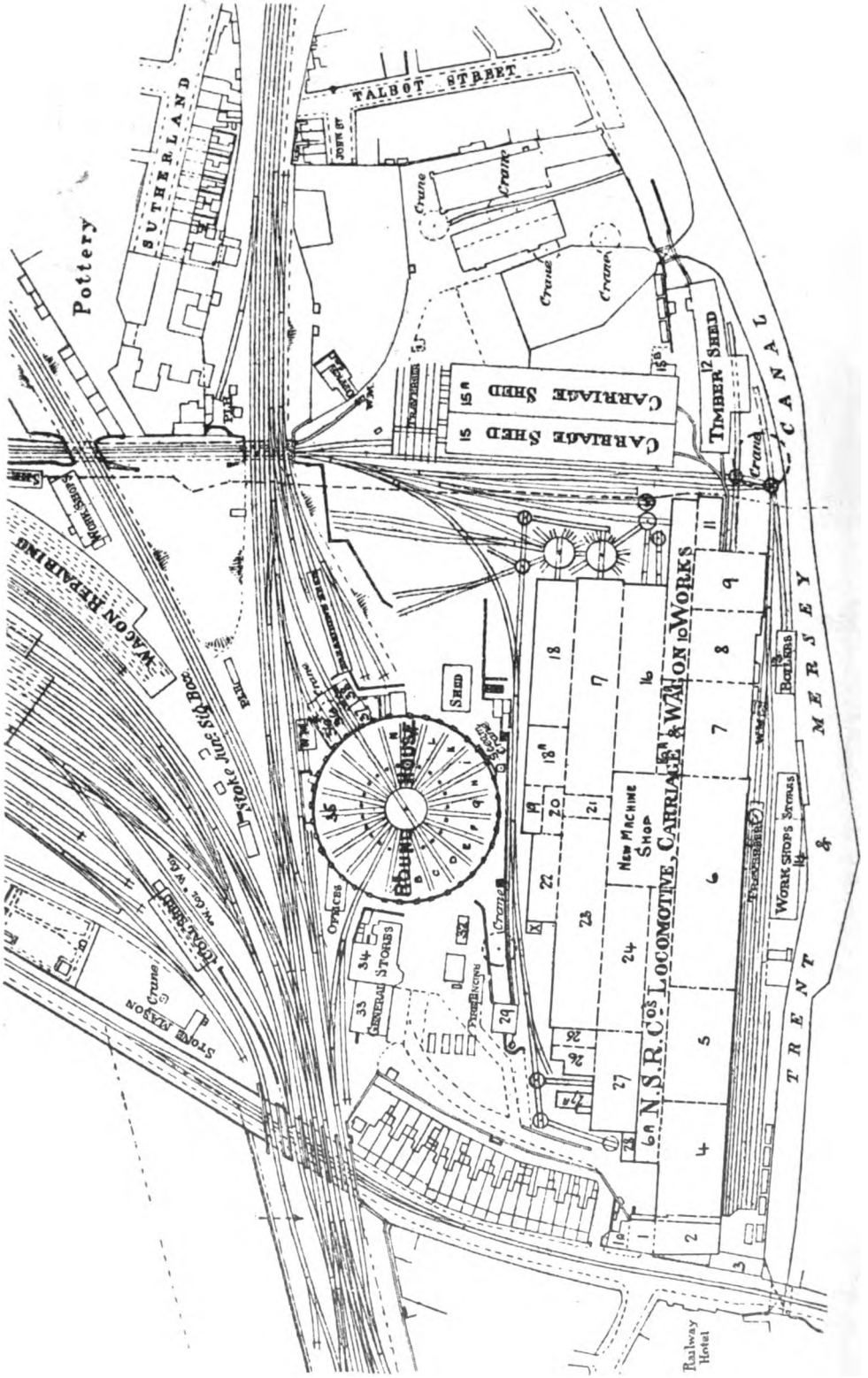

PLAN OF STOKE WORKS, NORTH STAFFORDSHIRE RAILWAY, SHOWING ALSO ROUND HOUSE AND OTHER BUILDINGS
The large running shed is placed near the wagon-repairing shop, a part being indicated at the top edge of the plan.

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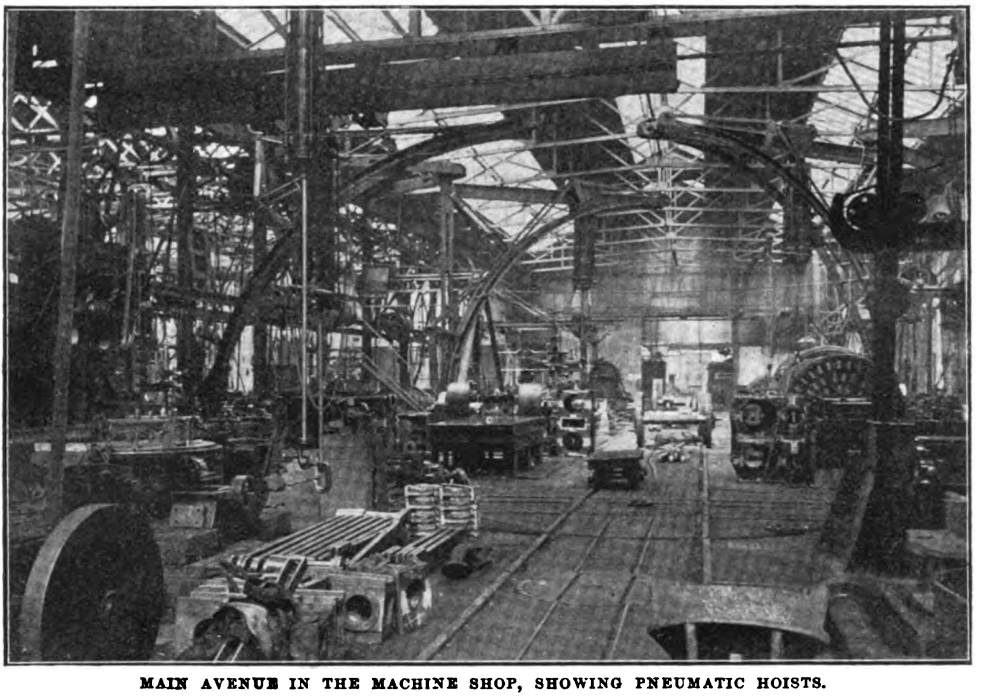
and mineral traffic as well as for passenger conveyance. Moreover, although the system itself is of a restricted and semi-local character, its engines and trains are met with—under the extensive running power arrangements mentioned above—as far afield as Rugby, Llandudno and Manchester, this fact explaining, indeed, the peculiar situation that the longest journeys, and the most remarkable express train runs, are made on foreign territory. As regards other factors, mention may be made of the Leek and Manifold Light Railway, the Trent and Mersey Navigation Canal, and the well-known quarries at Caldon Low, worked,



MAIN AVENUE IN THE MACHINE SHOP, SHOWING PNEUMATIC HOISTS.

owned or leased by the North Staffordshire Railway.

There is, therefore, in one way or another, considerable material for the engineering side of railway activities, and at Stoke, Mr. J. H. Adams, Locomotive Carriage and Wagon Superintendent, has under his charge workshops covering a considerable area, employing a large number of men, and including many features of interest and evidencing in several respects the applications of up-to-date engineering practices. Mr. Adams is assisted by Mr. W. J. Brown, Chief Clerk; Mr. A. J. Tassell, Chief Draughtsman; Mr. J. A. Hookham, Locomotive Works Manager; Mr. R. Dent, Carriage Wagon Works Manager; and Mr. T. H. Longsdale, Running Superintendent. In the locomotive shops 483 men are employed, and 391 in the carriage and wagon works, while the outside and running staff attached to the department numbers 741. The running sheds adjacent to the works are also of interest, and here are stationed the larger proportion of the locomotives in service, the remainder being at Alsager (near Crewe), Macclesfield, Derby, Uttoxeter and at sheds on other companies' lines.

The railway works are located about a quarter of a mile on the London side of Stoke station, and not far from Messrs. Kerr Stuart & Co.'s locomotive building shops. Most of the departments are on the west side of the Stafford line, occupying an area of 12 acres bounded, and unfortunately limited, by the Trent and Mersey Canal. The wagon repairing shop and the new rail motor car and running sheds—the old roundhouse is included in the area above specified—are placed between and alongside the Uttoxeter and Leek routes which diverge near this point. On the south the works area includes the new carriage sheds, timber sheds and store yards, these being separated

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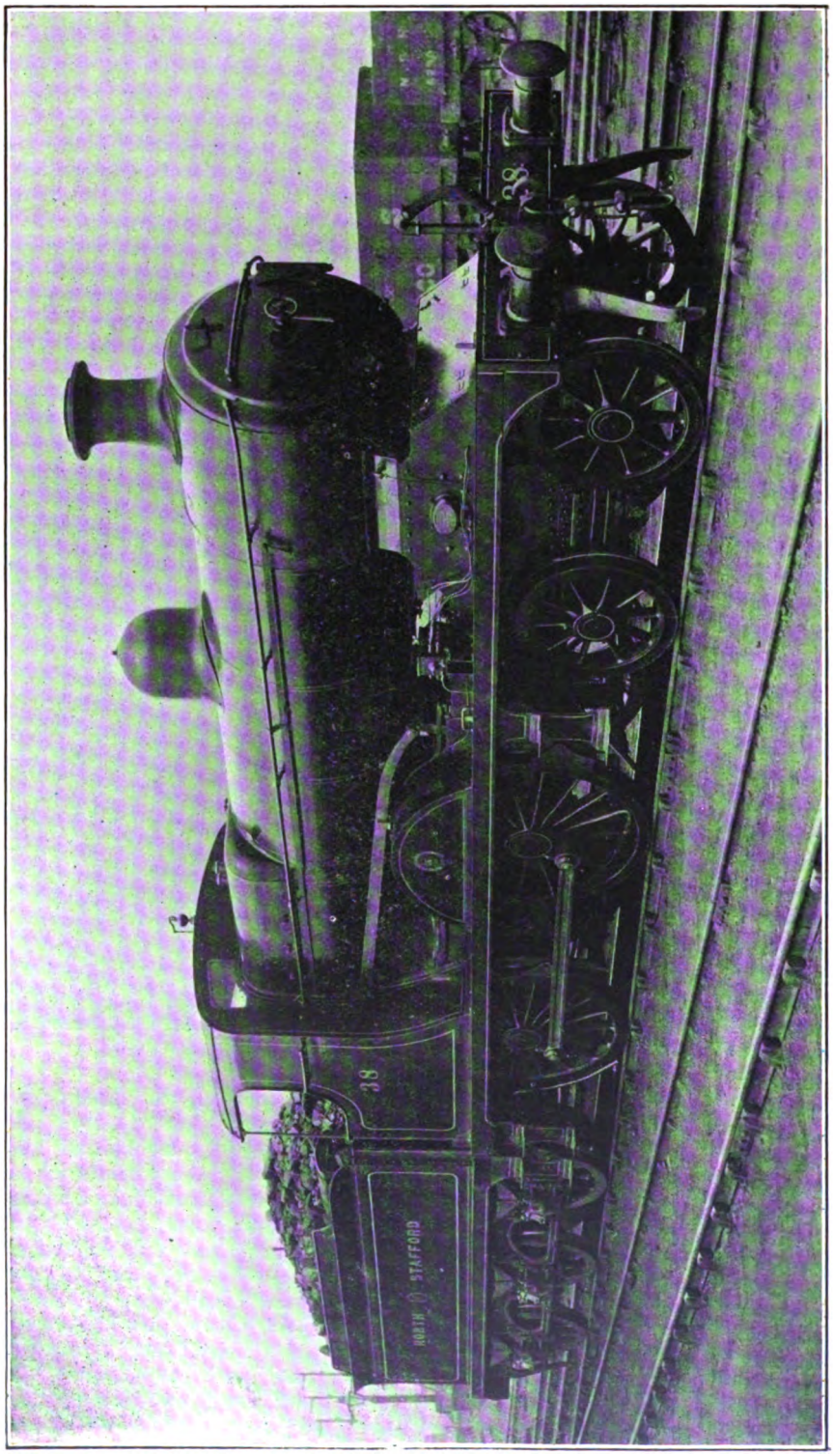

NEW 4–4–0 MAIN LINE LOCOMOTIVE, FITTED WITH SCHMIDT SUPERHEATER NORTH STAFFORDSHIRE RAILWAY.
Designed by Mr. J. H. Adams, Locomotive, Carriage and Wagon Superintendent.

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from the locomotive shops by the transverse railway tracks which pass under the Stafford and Uttoxeter lines to join the Leek branch, this constituting the principal means of communication between the works and the running lines. On the north Fenton Road, one of the main thoroughfares through the town of Stoke, constitutes the boundary, and here is the principal entrance to the works. The office and administration building is an ordinary brick erection. On the ground floor are the time office and works telephone exchange, a waiting room and messroom. It may be mentioned that in the waiting room a railway ticket case is installed, for supplying the workmen with privilege tickets. This is under the supervision of the chief booking clerk at Stoke station. Above are Mr. Adams' private office, that of his chief clerk and clerical staff, the main drawing office (which is a large airy room quite up-to-date, with a swivelling electric printing frame and full size valve gear model), locomotive inspector's office, stationery store room and lavatories. The staff here engaged includes, besides the departmental chiefs, three senior and four junior draughtsman, four clerks and three juniors, commissionaire and messenger.

MR. J. H. ADAMS.

Locomotive, Carriage and Wagon Superintendent, North Staffordshire Railway.

The works consist mainly of one solid block of intercommunicating buildings, with sundry additions built from time to time, and the buildings beyond the railway lines connecting with the Leek branch, besides a few other divisions located here and there. Mr. J. A. Hookham is in charge, as regards the locomotive side, his office being located overhead between the engine room and new machine shop so as to overlook the latter. Mr. Hookham has two clerks and a junior, and here, in addition to clerical work—the principal accounting is in the hands of the stores department—the draughtsman's work essential to a large works is carried out. The offices of the carriage and wagon department, under Mr. R. Dent, are partitioned off in one corner of the wagon shop. Here Mr. Dent is assisted by two senior clerks and a junior.

Opposite and below the general offices, across the entrance passage from Fenton Road, is a mess-room (2) for the workmen, and beyond, in a corner by the canal, is a trimmers' shop (3) on two floors where three or four men are engaged dealing with upholstery, saddlery, and other miscellaneous duties. Along the banks of the canal are various sheds for stores and the like; and, further along, wheelwrights' and general joinery workshops (14) and stores. A boiler house (13), containing four locomotive boilers, supplies steam to the smithy (7) opposite, and to the engine-room, which contains a duplex horizontal steam engine providing power for the saw mill (except the log saw) and the

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fitting shop on the carriage and wagon side. There is also a small shed adjacent containing a cleaning bosh for removing oil and grease from parts taken out for repair and replacement. Between these and the first range of shops is a long traverser path extending from end to end of the first range of shops, together with a few railway tracks as indicated in the plan reproduced on page 354, to which the reference numerals used above and hereinafter apply. The longest range of shops is that on the carriage and wagon side, and for convenience these may be first followed, commencing from the messroom (2). First comes the old paint shop (4), where also a portion of

MR. J. A. HOOKHAM.
Works Manager: Locomotive Department.

MR. R. DENT.
Works Manager:
Carriage and Wagon Department.

carriage and wagon repair work is done, with the pattern store. Next is the old body shop (5), where covered goods wagons, cattle, milk and brake vans and other vehicles are repaired; and this leads into the wagon shop (6) with Mr. Dent's offices in the corner. Transverse roads here are served by the traverser outside; and a large and well-lighted and airy shop is constituted, dealing mainly with open wagons of various types, both for repairs and new construction.

Beyond the partition wall is the carriage and wagon smithy (7) which contains three steam hammers, 14 smith's fires, blacksmith's anvils, spring furnaces, and a few appliances. Adjoining is a small smithy (7A) for miscellaneous work, including the tyring of road vehicle wheels. (8) is the carriage and wagon fitting shop for metal work, containing two combined punches and shears, two wagon wheel lathes, one large wheel lathe, several axle, general and screwing lathes, drilling and shaping machines and a few other tools. Adjoining is a wheelwrights' shop (10) with benches, a hack saw, emery grinders, small slotting machine, polishing tools, etc. Above is the carriage and wagon drawing office, where two draughtsmen are engaged. The saw mill (11) is a large and airy shop containing a complete assortment of wood working tools, including circular saws, band saws, a McDowell multiple log saw (driven by its own steam engine), a new Robinson boring, morticing, drilling and tenoning machine, a large planing machine which operates on two sides at once, and various drilling, boring, tenoning and other machines. This range of buildings is completed by the body shop (11) for new carriage work, and for repairing, painting and lifting carriages, though most of this work is now included in the new carriage shops yet to be considered. In the area immediately adjoining this portion of the works may be noted three

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large timber sheds, a large crane on the canal bank and a space used for general storage. The new carriage shops (15 and 15A) constitute together a fine building, with roads served by a traverser at one end. Here carriages are principally erected, and older ones lifted and repaired. A boiler-house adjoining provides steam for a small steam engine which runs the machines here provided.

Returning to the main entrance the locomotive shops now call for attention; but these cannot be considered in the same longitudinal order, so that it will be more convenient to deal with them in groups as they come under notice. Against the extension (6A) of the wagon shop is the gas meter house (28) and adjoining this is the new extension (27) to the boiler shop (107 ft. long). In effect this shop constitutes a direct extension of the older boiler shop (24), and as some of the tools are to be interchanged both sections may be considered together. The new crane lifts 6 tons, and like the overhead crane in the other shop (recently rebuilt at Stoke) is hand-operated. There is also a lighter 3-ton hand crane. An unusual feature in this department is an old steam rivetter which still renders good service, though in these days of almost universal hydraulic rivetters it strikes one as unfamiliar. A Fielding & Platt hydraulic rivetter is, however, also available.

In this division is the large hydraulic press, giving a pressure of 240 tons, for flanging throat-plates, firebox sheets and the like. Alongside is the coke furnace for heating the plates to be pressed. In the opposite corner of the shop is a Stoke-built wall engine, virtually a locomotive engine mechanism mounted on end, with the cylinders driving upwardly. This drives the machinery in the boiler shop and the greater portion of the works. Among the various machines may be noted large and small plate rolls, levelling blocks, large and small punches and shears, an edge planer by Scriven & Co., of Leeds, a new Craven radial drill and a few other drills and tools. Adjoining the boiler shop is the engine room (26) for the hydraulic plant, containing steam engine, pumps, and two locomotive boilers. Outside, in the open, is a third locomotive boiler, which is particularly interesting in that it is fitted with the Galloway-Hill furnace. These boilers also supply the shop engines and the steam hammers in the adjoining smithy. The wash-house opposite (27A), contains cloth washing and oil extracting machines supplied by the Bainbridge Engineering Co. There is also a drying house attached. The

MR. A. J. TASSELL.
Chief Draughtsman.

MR. T. H. LONGSDALE.
Running Superintendent.

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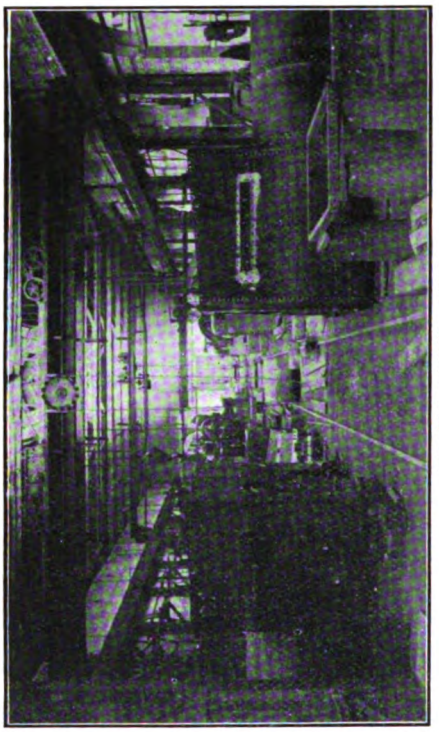
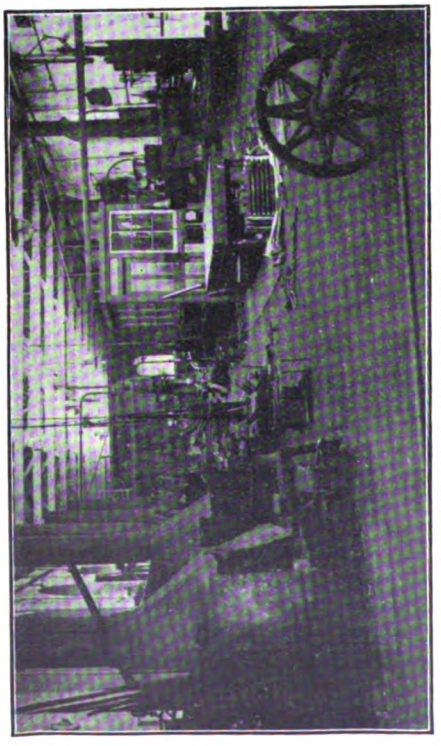
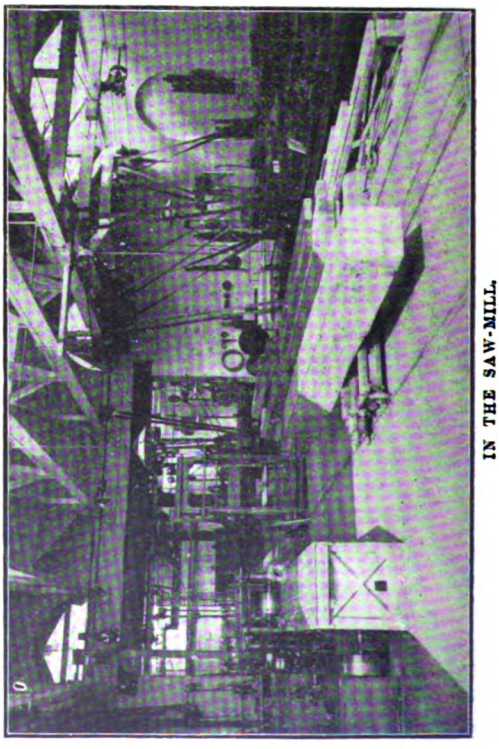


IN THE BOILER SHOP.

PART OF THE WAGON SHOP.



PORTION OF THE LOCOMOTIVE SMITHY.



IN THE SAW-MILL.

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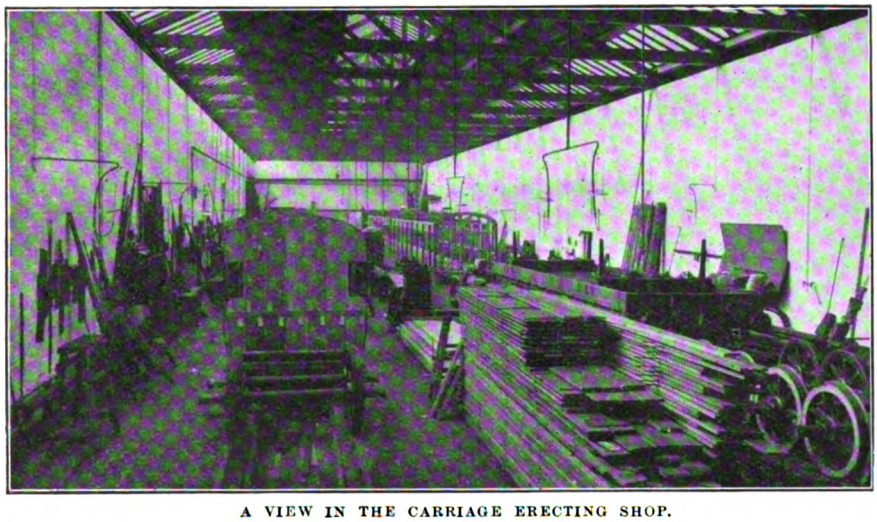
oil recovered in this way is utilised for the oil furnace in the spring shop. Outside this building is a coke mill, for crushing coke for the smith's hearths. Nearly all these divisions are recent additions.

The smithy (23) is a large section 230 ft. long and 45 ft. wide. It contains two Ross-Rigby steam hammers, and two older ones of 5 and 6 cwt. Of the two former, one is a 15 cwt. forge hammer for heavy work and the other, recently added, for 12½ cwt. The forge hammer is served by its own coal furnace, the other hammers being served by ordinary smiths' hearths. There are 17 smiths' fires. A portion of this shop is equipped for tyring wheels, with a coal furnace against the wall and a portable crane for lifting. There is also a new oil furnace for spring making, mentioned in another division. Two blowers supply blast for the smithy, and in suitable positions may be noted a hydraulic axle press (with automatic Schafer & Budenberg recorder), an old hydraulic press, a Fielding & Platt buckling and testing machine for springs, and buffing and grinding machines.

Reference may here be made to the pneumatic cranes, lifters and hoists which are to be found in the smithy, the boiler shop, and many other divisions. These were mostly designed and built at Stoke, and the largest are adapted for 6-ton loads. They number 13, distributed in various shops, and many of them are mounted on swinging run-ways and jibs. In fact, they constitute one of the characteristic features of Stoke works, and as such call for special reference. One of them is shown in the photograph of the machine shop on page 355. These hoists are of very simple design, consisting mainly of an air cylinder, with leather-packed piston, the rod of which passes through a stuffing-box in the bottom of the cylinder and terminates in a hook. The largest size in use at Stoke is 15 in. diameter and has a capacity of 6 tons. The admission of air is controlled by a valve operated by two chains, which hang within reach of the workman. The great advantage of these hoists is their simplicity and reliability—there being nothing to get out of order. Consequently they work for years with scarcely any attention. There is also an extensive equipment of pneumatic drills, caulkers and rivetters in the boiler shop.



A VIEW IN THE CARRIAGE ERECTING SHOP.

In line with the smithy is the erecting and machine shop (17) and between is the engine room (21), containing an old vertical engine (with fluted columns, dated 1849, and still rendering good service) driving the shop shafting by wooden toothed gearing, and the air compressors for the pneumatic plant. The boiler house (20) adjoining contains two locomotive boilers. Alongside the engine room is the shop stores, and overhead and overlooking the old and new machine shops are Mr. Hookham's offices. In a corner of the new machine shop, by the wall separating it from the boiler shop, is an interesting machine designed and built at Stoke for tapering out both crank pin holes of a pair of driving wheels at once. This has its own air hoist and lifter. Following the left-hand side of this shop alongside

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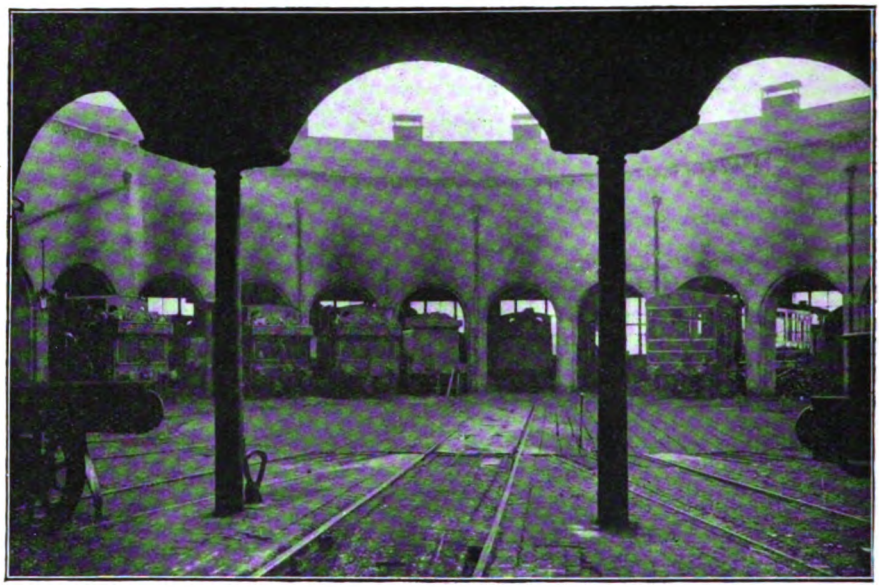
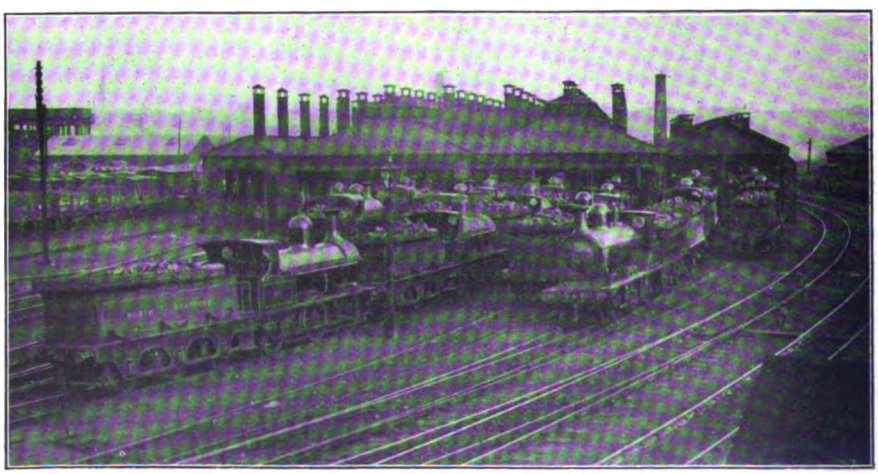


A REMARKABLE VIEW IN THE ROUND HOUSE.

the erecting and machine shop (17) and facing towards the south, the following machines may be noted: several wheel lathes, a tyre drill against the wall, a small vertical steam engine (usually in reserve, but capable of running the shop when only a few machines are in service), drills, and several small and miscellaneous lathes.

Opposite these the first machine calling for special attention is an adaptation of an old lathe to form a special tool for machining smoke box saddles. Between the headstocks are two revolving tool heads carrying cutters turning to the required radius. Further along may be noted a cold saw, two radial drills, one by Pollock & McNab and the other by Cravens (an Asquith drill is to be added shortly), a boring mill for cylinders (this will only deal with one cylinder at a time), marking-off tables, and cylinder-fitting benches. The side portion of this shop is given over to smaller machines, including an Alfred Herbert automatic lathe for boiler studs and stays, two semi-automatic Herbert lathes, a slotting machine, an axle lathe with burnishing attachment, and a number of lathes of various kinds, mostly of smaller and ordinary classes. In a corner



THE NEW ENGINE SHEDS.

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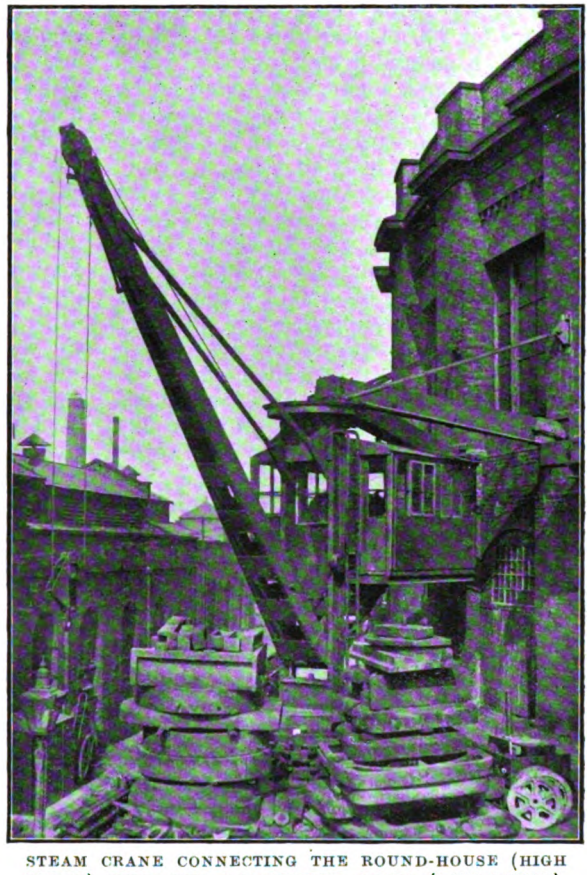
by the carriage and wagon smithy is the tool room and gauge store (16A). Here are kept the master and shop gauges, and also the shop drawings. A record board is provided to show the whereabouts of all items issued. Above, in a gallery, is a tool-making and maintenance shop, with tool grinders and a few appliances.

The main machine and fitting shop (16) at one time had a series of turntables down the centre and was associated with the erecting shop alongside; but these occupied too much space and have long since been removed. Following the left-hand side of the central passage-way the following machines may be specially mentioned: a new lathe by Redman, of Halifax, a new shaper, a planing machine, a very old shaper against the wall, a double-head valve planer operating on two faces at once (an old London and North Western design), a Kendall & Gent vertical miller, a large axle lathe, a slotting machine, a Churchill planer, and a large horizontal miller by Smith & Coventry. There are also benches for ordinary fitting work. Opposite these may be noted the following: various planers, drills and lathes, a vertical miller for coupling rods (Kendall & Gent), an old lapping-out lathe, an American screwing machine, a Pollock & McNab screwing machine, a slide bar grinder by Dorman & Co., of Stafford, a modern lapping-out machine, adaptable also for radius work, by the same makers; an emery disc grinder; a Dorman piston rod grinder; and a Dorman vertical internal grinder. There is also a 17-ton pneumatic press for pressing white metal bushes into coupling rods, and benches for assembling axle boxes, regulators, etc., and for boiler mountings. Racks for metal bars and tools are here provided as required. In the corner is a paint store and office.

The main erecting shop (17) is of the three-road type, and is served by two overhead 30-ton Craven electric cranes. The second erecting shop (18) is of the same type, but as it used to be exclusively the tender shop, its roof is lower. At the end of the main shop are a few big wheel lathes and the inner portion is now used for tenders. Some of the tank work is, however, done in the open yard adjoining. Portable



STEAM CRANE CONNECTING THE ROUND-HOUSE (HIGH LEVEL) WITH THE LOCOMOTIVE SHOPS (LOW LEVEL).

cylinder boring machines are provided as well as a few other appliances. In these shops I noted one of the small locomotives used at Caldon Low quarries placed in a truck for transit over the standard gauge lines. Access to the erecting shops is obtained by means of large turntables connecting with the line leading to the Leek branch, as already mentioned, and with various sidings adjacent. In a corner of the main erecting shop is the switch board for electric power which is obtained from the Stoke Corporation.

Beyond the second erecting shop is the permanent way machine shop (18A) with a usual assortment of drills, lathes, and rail planers, and an air compressor is placed in the corner. Alongside the boiler house (20) is the joiner's shop (19) with the pattern making shop above. The benches in the latter have each a trimming and paring device. A large trimmer, a grinder, a small band-saw, and a lathe are also provided. (22) is the coppersmith's shop and the brass

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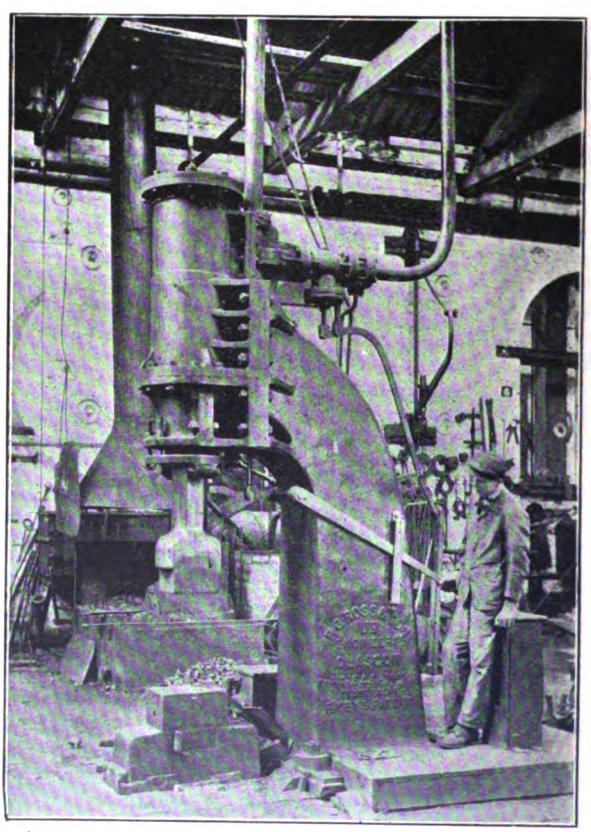
foundry, the latter being provided with four fires for 200 lb. and three for 100 lb. crucibles, a mould drying oven, a small swing crane, and a pneumatic sand sifter. In an annexe is a magnetic separator for cuttings. In the yard adjacent is a lean-to shed containing a pickling tank.

The whole area covered by the works proper, with the exception of the Junction Wagon Shops, the tinsmith's shop mentioned below, and the pattern store, is on the level of the Fenton High Street, and is equipped with standard railway tracks and with narrow gauge tramways for shop trolleys. On the higher level, associated with the round-house, are several other divisions, including the oil store (32), the fire engine house (31), the general stores (33 and 34), a few sheds and the yard storage available on ground overlooking the works proper. The basement of the round-house also accommodates the tinsmiths and serves as an iron store. In view of the lengthy transfer over standard running roads necessary to convey wheels and axles from the running shed to the works—for re-turning tyres and other purposes—a large steam crane adjoining the round-house has been provided. One of the roads in the latter leads on to a platform—protected by movable scotch blocks on the rails so designed that in the event of an engine overrunning it is impossible for more than one pair of wheels to pass, their action on the blocks forcing the second pair to be caught and held—so that wheels or other items placed on a special carrier can be lifted by the crane and lowered to the works area or raised therefrom. This crane has a jib of 20 ft. radius and is adapted for the required lift of 24 ft.

The round-house is quite an exceptional building. It is built to form a complete circle, the turntable in the centre being open to the sky. There are 23 radial roads. An overhead 60-ton electric crane by Messrs. Ransomes & Rapier is provided to run on circular tracks, and it could be sent round the complete circle, though in practice it is only worked half way round—the other roads being used for engines not requiring shed attention or lifting. Adjoining, on the further side, is the old coal-stage, the weigh-house, the depôt stores, and a building for the breakdown train, while the running shed offices are placed alongside the usual entrance road.

Beyond the Stafford and Uttoxeter lines are the wagon repairing shop, workshops adjacent thereto, and the newer straight-road running shed. This has six lines, with a shorter end road separated therefrom and known locally as "The Parlour" as it is generally used for special engines. On the other side is a shorter two-track shed for the rail motor cars. Beyond the latter is the sand furnace, while in continuation of the special road on the other side of the shed is the boiler house and a plant, installed by the Economic Boiler Washing Co., Ltd., for washing out boilers. In this plant the idea is to utilise the steam and hot water in the boiler of an engine that has come in for washing out, for the purpose of assisting to warm up the washing out water, also the water with which the boiler is filled after



NEW STEAM HAMMER, RECENTLY INSTALLED AT STOKE WORKS.

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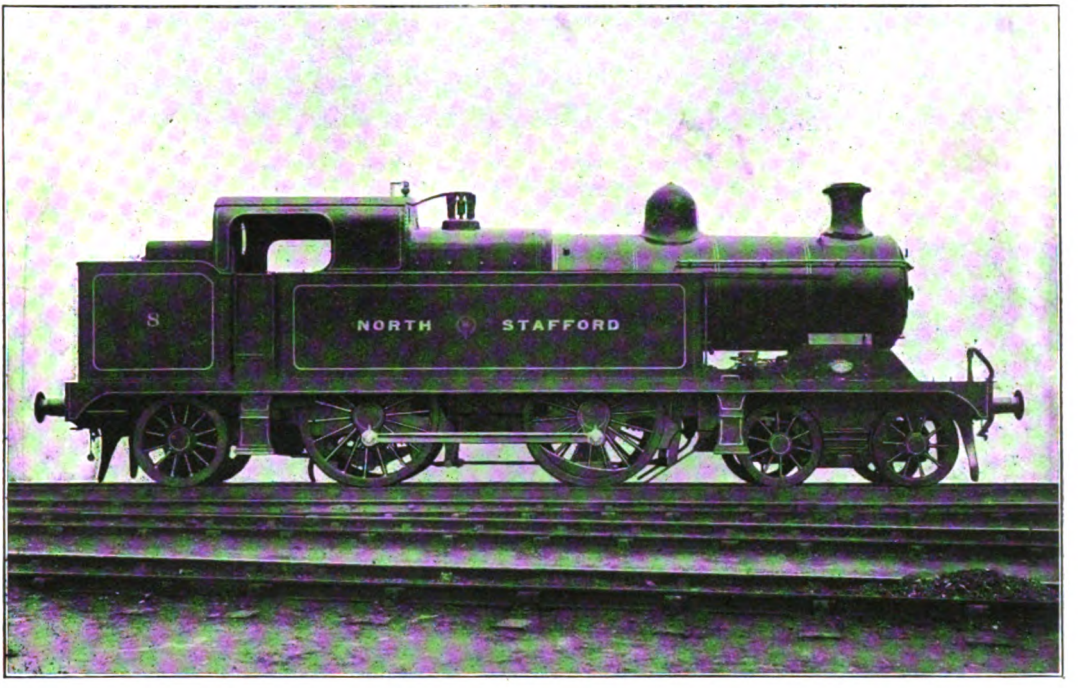
the washing out is completed. The shocks to the boiler through the sudden contraction caused by putting cold water into a hot boiler are hereby avoided, and much time is saved in the washing out process, because the contents of a boiler can be blown off into the hot water tanks as soon as the engine arrives at the shed, and the washing out can be immediately commenced with warm water. After the boiler has been washed out, it is filled with hot water, when the fire can be lighted, steam raised and the engine sent out into traffic again in the minimum amount of time. There are 18 fittings in the shed in connection with this plant.

The coal shed alongside the entrance lines for the running shed is somewhat interesting in that it is fitted with electric coaling cranes having a special equipment designed and built in Stoke Works. The larger engines with high tender or bunker sides could not be coaled conveniently with the cranes previously provided. A device is, therefore, fitted whereby after being partially lifted and swung out, the contact of the bucket holder with the end of the jib as the former is further raised causes the jib itself to rise, giving about 3 ft. additional lift.

It will be seen from the foregoing that the works at Stoke, while relatively small, are actually extensive and well equipped, including also several features of special interest.

A few remarks in reference to the modern locomotives of the North Staffordshire Railway will be of interest. Mr. J. H. Adams, the present Locomotive, Carriage and Wagon Superintendent, was appointed to the position in March, 1902, succeeding the late Mr. Luke Longbottom. At this period the Company was greatly in need of more powerful goods tank engines, and Mr. Adams, therefore, immediately designed some 0–6–2 six-coupled radial tank engines, having 18½ in. by 26 in. cylinders, 4 ft. 7 in. diameter boilers, with a total heating surface of 1,165 sq. ft. and 175 lb. pressure. The first six of these engines were built by the Vulcan Foundry and delivered in 1903. The most powerful engines in use previous to this had 18 in. by 24 in. cylinders and 4 ft. 4 in. boilers, with a total heating surface of 916 sq. ft. and 150 lb. pressure.

Several of the express engines previously in use were rebuilt in 1904 with 18 in. by



4–4–2 TANK ENGINE, FITTED WITH SCHMIDT SUPERHEATER.
Designed by Mr. J. H. Adams.

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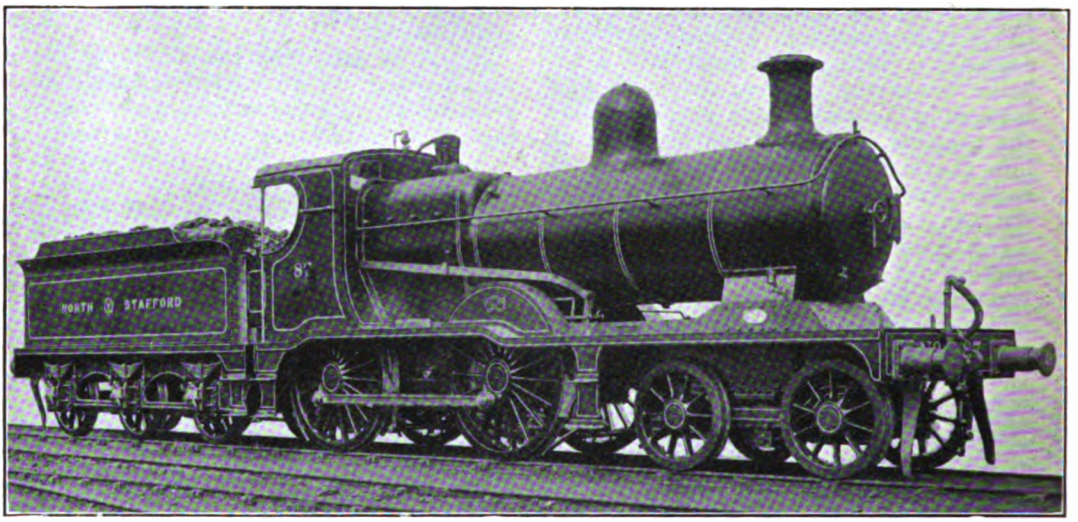
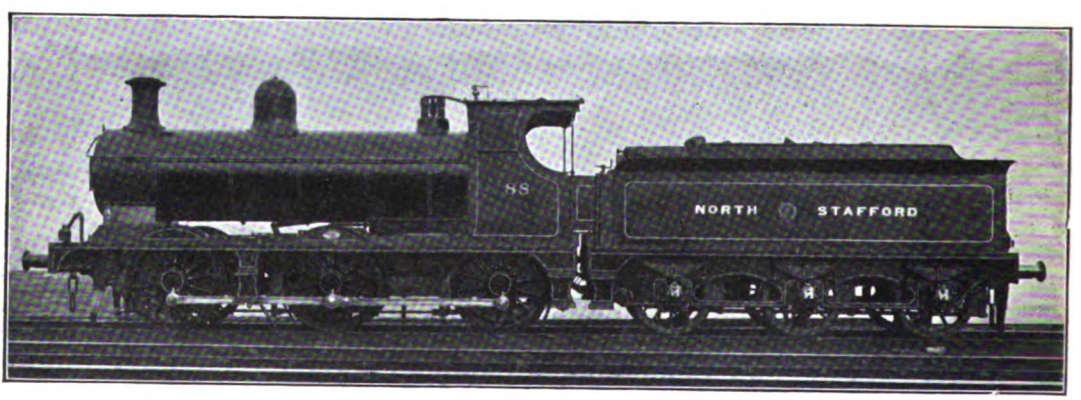
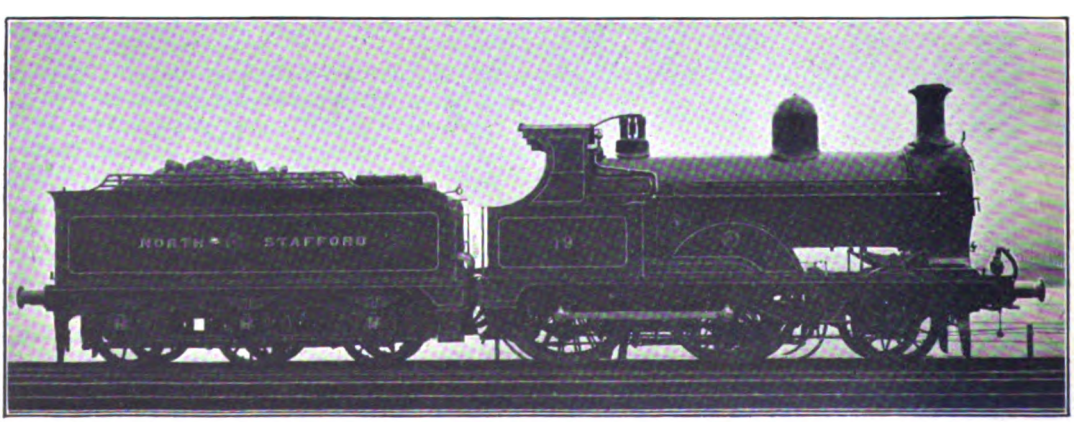


4–4–0 EXPRESS LOCOMOTIVE, WITH BELPAIRE FIREBOX.
Designed by Mr. J. H. Adams.



MAIN LINE GOODS LOCOMOTIVE.
Designed by Mr. J. H. Adams.



2–4–0 EXPRESS LOCOMOTIVE AS REBUILT.

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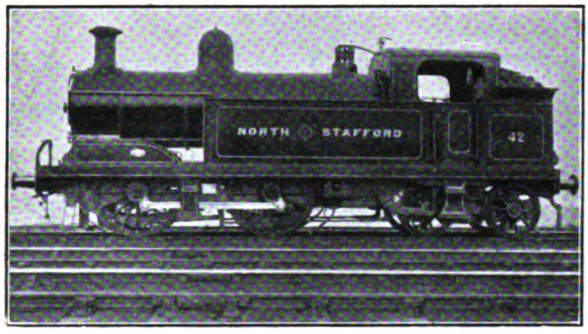

STANDARD 0–4–4 TANK ENGINE.
Designed by Mr. J. H. Adams.

24 in. cylinders, a larger boiler and a new tender having an increased water and coal capacity. As tank engines are the most useful type for the comparatively short runs of this railway, Mr. Adams next built a series of 0–4–4 passenger tank engines, which, by the way, were the first engines owned by the North Staffordshire having a four-wheeled bogie. These engines have proved most useful, and have worked most of the main line trains other than those necessarily hauled by tender engines. Their dimensions are 18½ in. by 26 in. cylinders, coupled wheels 5 ft. 6 in. diameter, boiler 4 ft. 7 in., diameter, total heating surface 1,120 sq. ft., boiler pressure 175 lb. Following these useful engines, a series of eight six-coupled radial tank locomotives were built, similar in general dimensions to the six built by the Vulcan Foundry. These locomotives are particularly useful, and do an immense amount of work, taking both goods and passenger trains. However, as North Staffordshire engines haul some long distance goods trains, such as the Stoke to Rugby, Liverpool, and other services, it was found necessary in 1909 to design some powerful goods tender engines capable of coping with the ever-increasing loads. Four were built with ordinary and four with Belpaire boilers. The chief dimensions of these locomotives are: Cylinders, 18½ in. by 26 in.; wheels, 5 ft. diameter; boiler, 4 ft. 7 in. and 4 ft. 9 in. (Belpaire) diameter; total heating surface, 1,120 sq. ft. and 1,197 sq. ft. (Belpaire); boiler pressure, 175 lb. The large tender carries 5 tons of coal and 3,200 gallons of water.

Having regard to the fact that several important London and North Western express trains have to be hauled either over a part of the North Staffordshire system or on the London and North Western Railway some of them timed fairly hard, some express locomotives were built in 1910, having Belpaire boilers 4 ft. 9 in. diameter, total heating surface 1,226 sq. ft., boiler pressure 175 lb., cylinders 18½ in. by 26 in., and coupled wheels 6 ft. diameter. The tenders fitted to this class are of the same design as the tenders of the goods engines.

The use of highly superheated steam having come to the fore in this country after having been proved economical and a big aid to increase of power, Mr. Adams commenced to build, towards the end of 1911, a series of large passenger tank engines fitted with Schmidt superheaters, and seven of these locomotives and one tender engine so equipped are now in active service and have realised very good results. The tender engine No. 38 has this year been used systematically for the principal Derby-Llandudno express, working from Stoke to Llandudno, often with heavy loads notwithstanding that a hard schedule is involved. The remaining superheater engines take the mid-day Manchester to London express from Manchester to Stoke and other long distance runs. At the present time Mr. Adams is building a further batch of six-coupled radial tank engines fitted with a feed-water heating apparatus. Four of these are in service and doing remarkably well. After these are built, it is proposed to construct a series of 0–6–4 tank engines equipped with both superheaters and feed-water heaters. A dimensioned diagram of these engines is shown.

With the exception of the six radial tank engines, described earlier, all the locomotives illustrated have been built in the Company's locomotive works at Stoke-on-Trent. One of the features of all the engines illustrated

0–6–2 RADIAL TANK ENGINE.
Designed by Mr. J. H. Adams.

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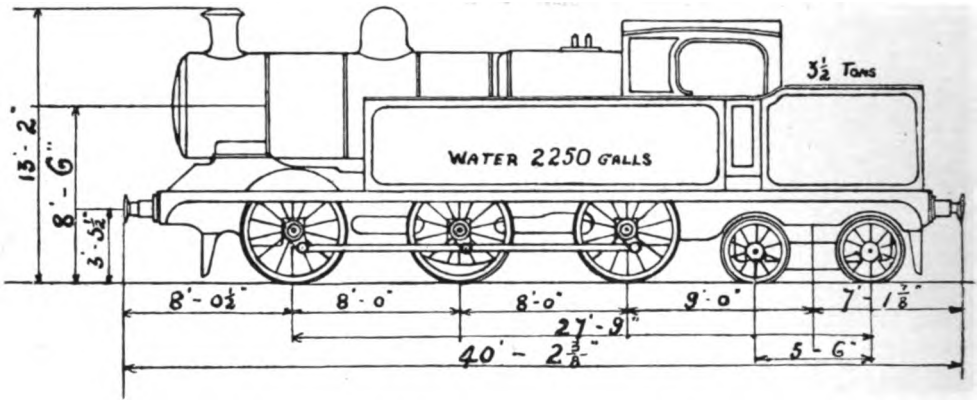


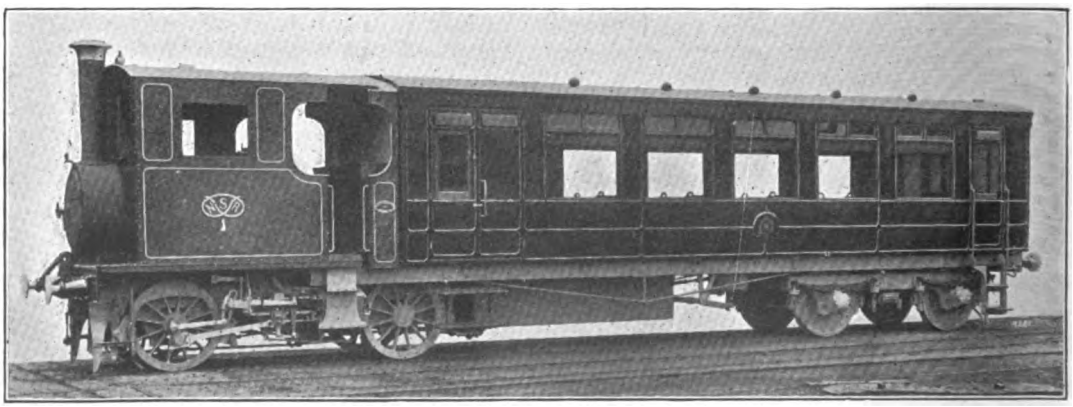
LINE DIAGRAM OF 0–6–4 TANK ENGINE, FITTED WITH SUPERHEATER AND FEED-WATER HEATER, SHORTLY TO BE INTRODUCED ON THE NORTH STAFFORDSHIRE RAILWAY.

Designed by Mr. J. H. Adams, Locomotive, Carriage and Wagon Superintendent.

(with the exception of the 19 class) is the circular smokebox and neat cast-iron saddle upon which the front end of the boiler rests. Three steam rail motors together perform a fairly large amount of local traffic.

As regards rolling stock, there is a usual equipment of well designed and comfortably upholstered passenger bogie coaches, in many cases in set trains of five carriages. The wagon stock does not call for special attention. The Leek and Manifold Light Railway is worked by narrow gauge engines and vehicles of appropriate design.

Mr. Adams is the third son of Mr. William Adams, C.E., late Locomotive Superintendent of the London and South Western Railway. He was born in September, 1860, educated at the Brighton Grammar School, Thanet College, and privately in Brussels by the Rev. A. K. Harlock, British Chaplain. He commenced an apprenticeship at Stratford Works, Great Eastern Railway, under his father in 1877, and when Mr. William Adams succeeded Mr. William George Beattie as Locomotive Engineer of the London and South Western Railway he was transferred to Nine Elms. Upon the completion of his training he served as a fireman for nine months and afterwards had charge as an engine driver of goods and passenger trains for 15 months on the London and South Western Railway. One year was spent with Messrs. Tannett, Walker, of Leeds, to gain experience in hydraulics. From July, 1887, to September, 1898, Mr. Adams was Locomotive, Carriage and Wagon Superintendent of the Donna Thereza Christina Railway in Brazil. From January, 1899, to March, 1902, he was Assistant Manager of Locomotive Works, South Eastern and Chatham Railway, holding this position until appointed to his present position.



RAIL MOTOR CAR.

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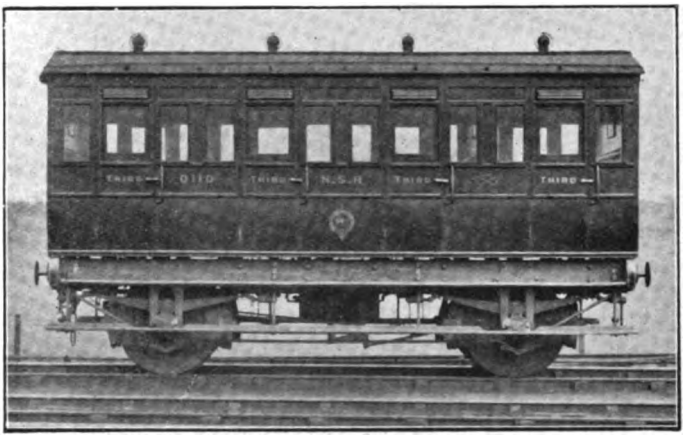
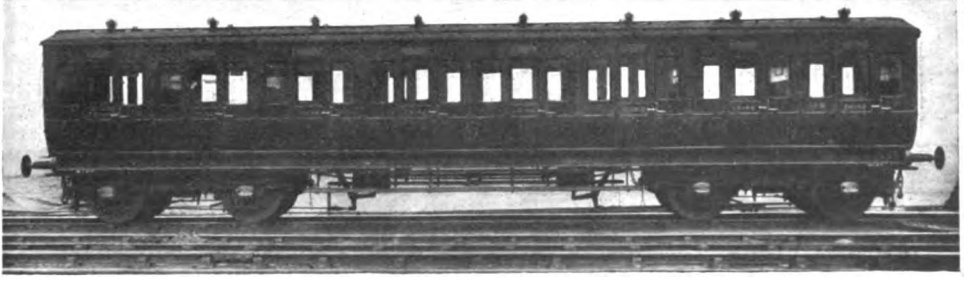


AN OLD THIRD-CLASS CARRIAGE, BUILT IN 1875.

Mr. J. A. Hookham, Locomotive Works Manager, was a pupil on the London, Chatham and Dover Railway under Mr. William Kirtley, at the Battersea Works. After gaining experience in the various workshops and drawing office, he had some running experience, serving for about six months as a fireman on a locomotive. Subsequently, Mr. Hookham was engaged as a draughtsman at the Battersea Works, and on leaving there was employed in the same capacity with several private firms. After about four years absence, he returned to the London, Chatham and Dover Railway, and was engaged as a draughtsman, also teaching classes in technical subjects at the Battersea Polytechnic. When the South Eastern and Chatham and Dover Companies amalgamated, Mr. Hookham was transferred to Ashford Works, and remained there until he was appointed Locomotive Superintendent of the Donna Thereza Christina Railway, Brazil, in 1900. Two years later this railway was taken over by the Brazilian Government. Shortly afterwards Mr. Hookham resigned his position, and in October, 1902, commenced his engagement as Locomotive Works Manager at Stoke. In 1904 he became a member of the Institution of Mechanical Engineers.

Mr. R. Dent, Carriage and Wagon Works Manager, received his railway training on the London and North Western Railway at Wolverton, commencing as an apprentice there under Mr. R. Bore, and later served under Mr. C. A. Park. The London and North Western Railway Carriage Works had just been removed from Saltley, Birmingham, to Wolverton, and it happened that Mr. Dent was the first apprentice to be started in the coach building department after the removal. He was engaged with the London and North Western Railway Company for 22 years, building during that time many of the most up-to-date coaches turned out of the Wolverton Works. During the last four years that Mr. Dent spent with the London and North Western Railway he was foreman of the coach builders. In 1889 he was appointed to his present position on the North Staffordshire Railway.

Mr. A. J. Tassell, Chief Draughtsman, was born on September 12th, 1876, and educated at Tonbridge. He began his engineering career on the South Eastern Railway under Mr. James Stirling, who was then Locomotive Superintendent. After going through the various shops in Ashford Works, and also having about two years running shed experience, Mr. Tassell entered the drawing office, and finished his apprenticeship there. He was afterwards engaged for about two years as a draughtsman at Ashford, and



THIRD CLASS BOGIE CARRIAGE, BUILT 1906.

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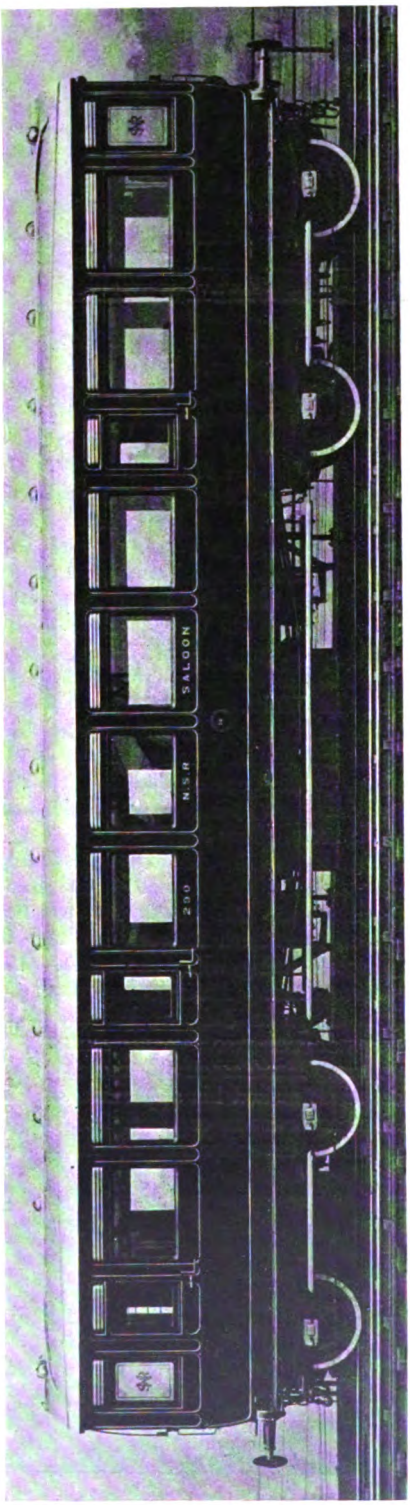

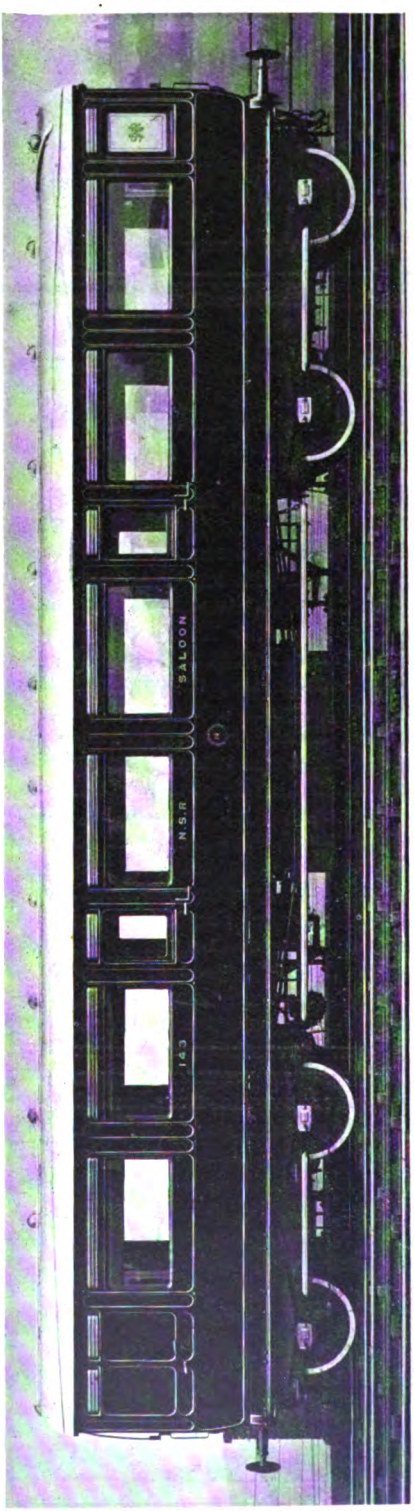

TWO SPECIAL SALOON CARRIAGES, CONSTRUCTED AT STOKE WORKS, NORTH STAFFORDSHIRE RAILWAY.

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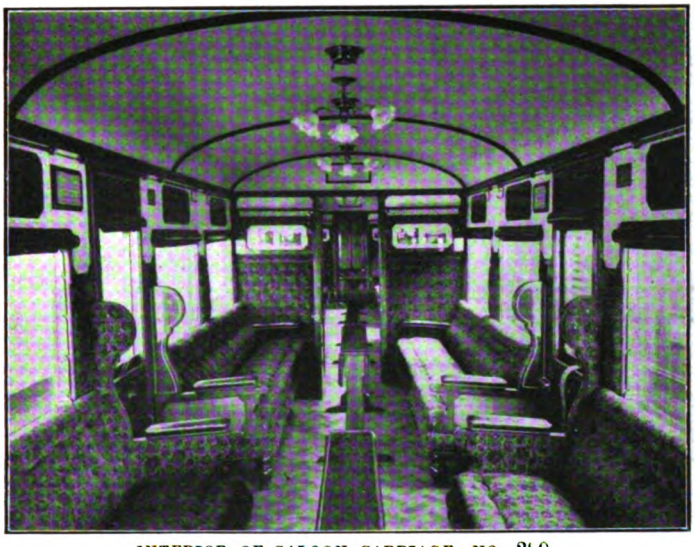
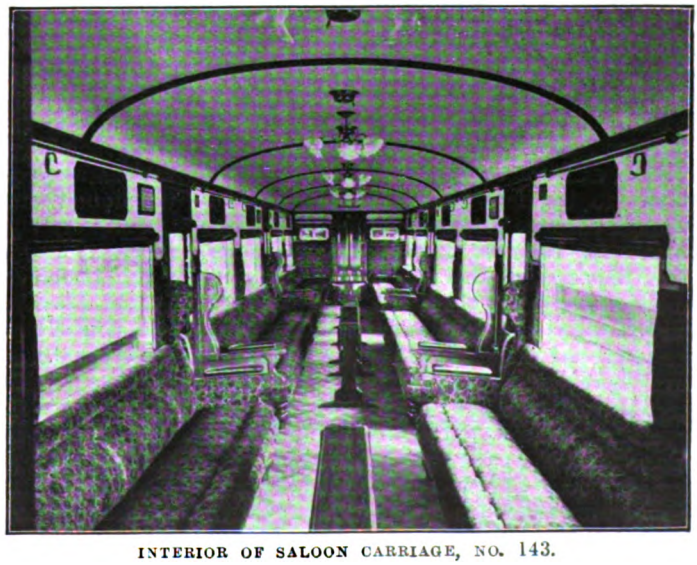


INTERIOR OF SALOON CARRIAGE, NO. 290.

during part of this time assisted in teaching the Technical Classes at the South Eastern Railway Mechanics Institute. He went to Glasgow in 1901, and was engaged as a draughtsman about twelve months with Messrs. Neilson Reid and Co. (now the North British Locomotive Co.) at the Hyde Park Locomotive Works. During this time Mr. Tassell took a further course of study at the Glasgow and West of Scotland Technical College. In 1902 he was appointed to his present position, and for several years also had charge of the inspection of materials, making repeated journeys to the Continent on behalf of the North Staffordshire Railway Company, for the purpose of inspecting materials for private owners wagons. In addition to his ordinary duties, Mr. Tassell is in charge of the teaching of the Technical classes held in connection with the Stoke Works.

Mr. T. H. Longsdale, Running Superintendent, commenced his apprenticeship in the North Staffordshire Railway Works at Stoke in 1885, doing the round of the various shops and drawing office. Upon the completion of his apprenticeship, he was drafted to the running department at Stoke, serving about three years at the shed, and being for part of this time in charge of the breakdown gang. Mr. Longsdale next went to Derby as foreman of the North Staffordshire Railway locomotive running shed, and after being engaged for about ten years at Derby, came back to the main engine shed at Stoke as second in command. Later he was appointed to the premier position.

In conclusion, the writer would express his appreciation of the courteous co-operation of Mr. Adams himself, Mr. Hookham (who acted as guide and conductor as far as the locomotive works were concerned), and other members of the staff of the locomotive, carriage and wagon department, in regard to the preparation, compilation and presentation of this article.



INTERIOR OF SALOON CARRIAGE, NO. 143.

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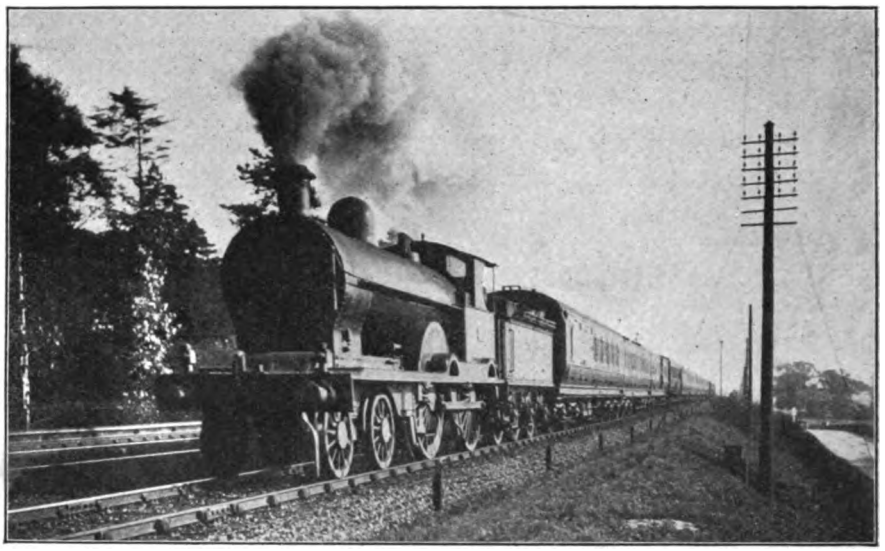

Photo] [*H. T. Worlock.*

2.40 P.M. DOWN LIVERPOOL, MANCHESTER AND EAST LANCASHIRE EXPRESS.
4–4–0 Locomotive No. 1510, *Psyche.*

Winter Through Carriage Services:

LONDON AND NORTH WESTERN RAILWAY.

IN these days of through train and through carriage services in all directions, it is usual to expect comprehensive facilities during the summer months; but it is not so generally realised that such arrangements are provided by many leading railways during the winter period on a singularly generous basis. The London and North Western Railway is well to the fore in this respect, as befits its reputation. This is due partly to the fact that a number of the through carriage arrangements are provided mainly for business travel, and are, therefore, required all the year round; but in many other cases there are resorts to be served which are in favour with invalids, for week-end visits and for winter vacations and short holidays taken by independent people and families during the "off" months. Indeed, there are many places where through vehicles are in demand at all periods, such as the south coast resorts, served from the north by the "Sunny South Special," the through South Eastern and Chatham vehicles, the Bournemouth services (*viâ* Birmingham and Midland, Midland and South Western Junction and Somerset and Dorset Railways), and the West of England trains and carriages to Exeter, Torquay, etc.; Colwyn Bay, Rhyl, Llandudno, Bangor, etc., on the North Wales main line; the Spas of Central Wales; the Cambrian Coast, as well as the Lancashire coast resorts—Southport, Blackpool, etc.—and to some extent Kendal and the Lake District. One may also add the English Spas, such as Buxton, Leamington, and Harrogate; and the favourite Scottish resorts, including Oban, the Clyde, Perth, and various other places which provide all-the-year-round interest.

From the business point of view it is only necessary to mention the through carriages from London to various Lancashire towns—Bolton, Blackburn, Oldham, etc.—to Barrow and Whitehaven, and to the Black Country; those from Birmingham to various industrial districts; from Liverpool and Manchester to the same places, and to Newcastle and the North Eastern manufacturing and colliery areas; and other facilities of a like character. These are, of course, in addition to the standard traffic arrangements, with which we are not at present concerned. The London through carriage arrangements may first be dealt with—omitting the special services *viâ* Willesden Junction, which apply mainly for traffic to and from the northern districts. The 10 a.m. Scotch express is the

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first which calls for attention. This conveys through carriages for Gourock and for Dundee, in addition to the standard Scottish routes. The 10.10 a.m. train is remarkable for its comprehensive character, as regards other than direct main line traffic. Although followed and passed by the 10.30 a.m. Liverpool and Manchester express, this has a through vehicle for Liverpool—for intermediate traffic—and also serves Barrow, Kendal, Windermere and Whitehaven *vid* Carnforth and Oxenholme by special accommodation. Then comes the 10.30 a.m. express, with through

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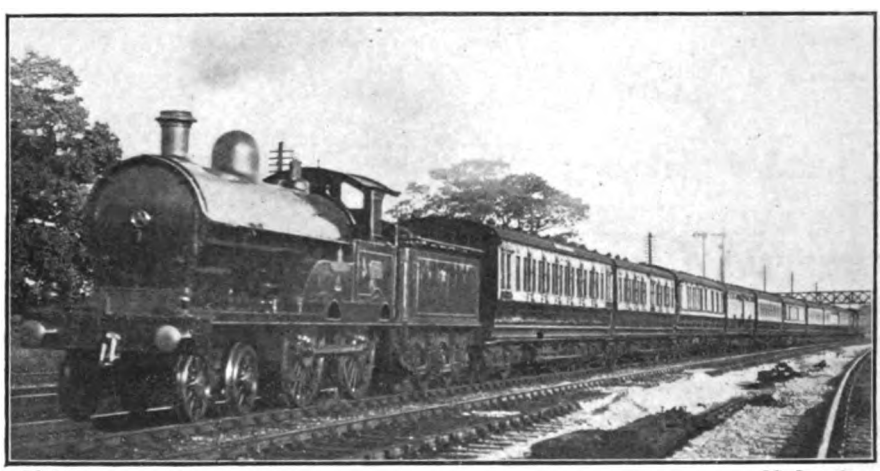
Lancashire and Yorkshire vehicles for Manchester (Victoria), Accrington, Blackburn, Bolton, Burnley, Colne, etc.

It is, however, the 10.37 a.m. train which provides the most comprehensive series of through facilities. The first to be detached is the through carriage for Buxton, slipped at Nuneaton and then conveyed *viâ* Shackerstone to Burton, Uttoxeter, and Ashbourne. At Stafford the Aberystwyth and Swansea coaches are detached. These travel together to Shrewsbury, and the former is then conveyed to Welshpool and the Cambrian line, and the latter continues, attached to a Central Wales train, to complete its roundabout journey from London to Swansea, serving *en route* the Central Wales Spas and resorts—its main *raison d'etre*—of Llandrindod Wells, Llangammarch Wells, Llanwrtyd Wells, Llandilo, Llandovery, etc. Meanwhile the main train continues its journey—with a restaurant car as far as Chester—to serve the various resorts along the North Wales coast line, completing a remarkable series of through arrangements and facilities.

The 12.15 p.m. Manchester express *viâ* Stoke and Macclesfield is hardly within our subject; while the 1.20 p.m. Irish Boat express is only of interest in this connection because of the through vehicles for the Central Wales resorts and Swansea *viâ* Stafford. But the 2 p.m. Scotch express introduces some new factors. The through coaches for Barrow and the Furness Railway are taken by the second portion on the northern section and detached at Carnforth; but it is the Altrincham coach which includes the most interesting features. This is detached at Crewe, and then travels *viâ* Northwich, Knutsford, and various Manchester district stations to Oxford Road and finally London Road. This affords a very convenient service for the Manchester area, every station being served either regularly or conditionally.

Another series of comprehensive arrangements is provided by the 2.40 p.m. Liverpool and Manchester express, differing, except as regards the Accrington, Blackburn, Bolton, Burnley, and Colne facilities, from any of the earlier trains. The slip carriage detached at Rugeley is taken forward to Stafford, Shrewsbury, and Welshpool, and by means of connections at Crewe and beyond through vehicles are provided for Southport, Kendal, and Windermere. Between 4 and 6.5 p.m. quite a number of through connections are given. The 4 p.m. Manchester train, although it travels *viâ* Stoke and Macclesfield, conveys carriages for East Lancashire towns as in the case of the 10.30 a.m. and 2.40 p.m. trains, except that the connections are made at Stockport instead of Wilmslow. In addition a slip carriage is detached at Bletchley for Banbury. The 4.5 p.m. train for Liverpool has through vehicles for Blackpool (Central) and for the North Wales line as far as Bangor. By the 4.45 p.m. two-hour express for Birmingham a through carriage for Dudley is conveyed. Primarily the Belfast dining car express *viâ* Fleetwood, the 5.30 p.m. train also serves, by the slip vehicles detached at Nuneaton, the Burton, Uttoxeter, Ashbourne, and Buxton route.



Photo] [*C. Laundy.*

5.30 P.M. BELFAST BOAT EXPRESS.

Locomotive No. 1800, *Coronation* (Schmidt Superheater).

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On the 5.55 p.m. Liverpool train there is a Southport carriage, and the 6.5 p.m. Manchester express serves not only Accrington, Bolton, Burnley, and Colne, but also Oldham and Rochdale and the Ribble Valley as far as Clitheroe.

Of the night trains, the 8 p.m. Scotch express serves Oban on Mondays and Fridays as well as the Stranraer line, besides conveying the Inverness carriages on Mondays, Wednesdays, and Fridays; the 8.50 has a through carriage for Gourock; and the 11.45 p.m. conveys Dundee vehicles. The 10 p.m. train has a through carriage for Aberystwyth, while the 12.5 (midnight) serves Barrow and Whitehaven.

There is no need to consider the up services in return. On Sundays the 12 noon express conveys through vehicles for East Lancashire towns. The Stranraer vehicles are then combined with the 8.30 p.m. postal train.

In the case of Birmingham, facilities are even more comprehensive than they are from London. The "Sunny South Special" at 1 p.m. provides direct access by restaurant car train to Brighton and Eastbourne. The Continental and other connections with the Great Eastern Railway give through facilities to Harwich, Ipswich, Peterborough, Bury St. Edmunds, etc. Northwards, Barrow and Whitehaven are served by the 2.55 a.m. (3.15 a.m. Mondays) train. Macclesfield and Stoke are reached by certain trains travelling over or in conjunction with the North Staffordshire Railway. The North Wales resorts obtain several regular or certain-day trains apart from connections with the London services. There are also trains for Kidderminster, Wellington, Welshpool, Stourbridge Junction, Woofferton, and the "City to City" expresses serving Broad Street as an alternative to Euston in London.

In Manchester and Liverpool the Leeds route and connections to Newcastle and the North Eastern system add further variety to the facilities available; while the south-westerly routes *viâ* Crewe and Hereford to Cardiff and to the Great Western system constitute important factors. Indeed, one may say that from Liverpool through trains and through carriage services radiate in all directions. To the north, Penrith, Carlisle, and Windermere are served from the Lancashire and Yorkshire station at 7.55 a.m., and at 3.15 and 5.50 p.m. to Carlisle, but not to Windermere. There are, however, four or five services from Lime Street to Windermere conveying a considerable amount of traffic, three to Barrow, one to Blackpool, two to Whitehaven, and one to Penrith. To the east there are four joint London and North Western and North Eastern through trains for Newcastle-on-Tyne, most of them travelling *viâ* Stockton and Sunderland; an additional service to York; four services to Harrogate; and three to Hull. To the south there is the through train for Brighton and

Photo] [*E. A. Gurney-Smith.*

DOWN "SUNNY SOUTH SPECIAL," SHOWING SOUTH EASTERN AND CHATHAM THROUGH CARRIAGE FOR MANCHESTER NEXT TO ENGINE.

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Photo [*H. T. Worlock.*

UP "SUNNY SOUTH SPECIAL" PASSING WATFORD.
Locomotive No. 645, *Mammoth.*

Eastbourne; two trains for the Central Wales line as far as Swansea; one for Oswestry and Aberystwyth (12 noon); and the Great Western services at 7.10 and 11.55 p.m. for Newport and Cardiff, 9.10 a.m. for Exeter and Plymouth, at 10.30 a.m. for Weston-super-Mare, Exeter, Paignton, Torquay, and Kingswear, and at 11.55 p.m. for Exeter, Plymouth, and Penzance. Westward there are, of course, through trains for the North Wales resorts, Colwyn Bay and Rhyl getting four or five trains, Llandudno three or four, and other places almost the same facilities.

From Manchester (London Road), the facilities towards the south are very similar, but include several interesting amplifications, with the 10.15 a.m. South Eastern and Chatham vehicles for Ashford, Folkestone, Dover, Deal, and the 10 a.m. service for Bournemouth and Southampton *viâ* Birmingham, and the Midland, Midland and South Western Junction and Somerset and Dorset Railways, added. The "Sunny South Special" leaves at 11.20 a.m.; Newport and Cardiff are served at 9.25 a.m., 12.15 and 7.10 p.m.; Cheltenham and Gloucester at 10 a.m.; Carmarthen at 12.15 p.m.; Oswestry and Aberystwyth at 8.20 a.m. and 12.15 p.m.; Exeter at 9.25 a.m. and 12.5 (midnight); Swansea and the Central Wales resorts at 12.15, 3 and 11.55 p.m.; Paignton at 9.25 a.m. and Plymouth at 12.5 (midnight). Although there is no through carriage from Manchester to Penzance (Plymouth being the limit), there is one from Penzance to Manchester at 12 noon. This is an example of the small differences to be noted in particular instances to suit conditions of traffic which do not always apply equally in both directions.

The eastern, western, and northern services are mostly provided from Manchester (Exchange). In fact, as regards northward traffic Manchester (Victoria) is also concerned, the Scottish and Furness trains being divided over the exclusively North Western and the Lancashire and Yorkshire routes to Preston. In this way, in addition to Glasgow and Edinburgh, Barrow is served at 7.55 and 9.45 a.m. from Victoria and at 1.50 p.m. from Exchange; Penrith at 3 p.m. from Victoria and 5.45 from Exchange; Whitehaven at 7.55 a.m. from Victoria and 1.50 p.m. from Exchange; Windermere at 7.55 a.m. (Mondays only), 9.45 a.m., 12.40 p.m. (Saturdays only) from Victoria and 8 a.m. (Mondays only), 1.50, 4.15 and 5.7 (not Saturdays) p.m. from Exchange. Blackpool (Talbot Road) is served at 9.10 a.m., and Morecambe at 5.45 p.m. from Exchange. Crewe is served from Victoria by the East Lancashire through carriage facilities to and from London, and Stockport gets five or six trains and Stoke one in this way; but all other traffic under review is dealt with at Exchange station. Rhyl, Colwyn Bay, and Llandudno have five or six trains, and Bangor, Carnarvon, Abergele, and other North Wales resorts are nearly as well served. Eastwards there are the same trains as from Liverpool for the North Eastern line, giving four trains for Newcastle (one *viâ* Darlington), four for Harrogate, and three for Hull.

Bearing in mind that a large proportion of these trains provide restaurant car accommodation, and that besides the services mentioned or indicated there are hundreds of others on the same or additional routes where a single convenient change only is involved, it will be seen that the traveller is as well served for journeys of this class as he is by the standard trains between London, Birmingham, Liverpool, Manchester, Edinburgh, Glasgow, Aberdeen, Holyhead, and so on. One may indeed, claim that through carriages are run wherever there is a reasonable demand therefor. In some cases the actual vehicles do not belong to the London and North Western Company, but include

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West Coast Joint Stock, Lancashire and Yorkshire, Great Eastern, Great Western, Cambrian, Furness, North Eastern, North Staffordshire, South Eastern and Chatham, London and South Western, and other vehicles which may be employed either exclusively or on a mileage or sharing basis. In this way through carriages are to be found far beyond the limits of the London and North Western system—in the far north at Aberdeen, Dundee, Oban, Inverness, and even at Dingwall, Strathpeffer and Helmsdale (if the sleeping cars are taken on beyond Inverness, as occasionally happens); at Stranraer, Barrow, and at many Lancashire and Yorkshire or joint stations in Lancashire; at Hull, Newcastle, Stockton, and Harwich in the east; at Aberystwyth, Swansea, and Cardiff in Wales; as far as Torquay, Kingswear, Plymouth, and Penzance in the south-west; and along the south coast at Bournemouth, Southampton, Brighton, Eastbourne, Folkestone, Dover, and Deal.

In conclusion, a few odd items of interest may be briefly summarised. In extension of the North Wales main line to Holyhead, there are through services to Carnarvon, Afonwen, and Pwllheli from London and Liverpool; Birkenhead obtains through vehicles for the North Wales line as well as the London and other services; by the 11.20 a.m. train from Great Moor Street, Bolton obtains a through carriage *viâ* London and North Western Railway to London *viâ* Manchester, Stockport and Stoke; Bradford has a through carriage to Stockport at 8.35 a.m.; Cambridge has through trains for Oxford three times a day each way; some of the services between Liverpool and Manchester and the Great Western line are extended to connect Cardiff and other Great Western stations with Huddersfield, Leeds, Newcastle, and York; Carlisle has two through carriage services to Keswick; from Coventry there are through services to Loughborough and Nottingham over the Midland Railway, besides many of the Birmingham arrangements; Crewe has nearly all the facilities mentioned which can in any way apply; Derby (North Staffordshire Railway) has one through service for Chester; Leamington Spa has one Liverpool, one London, two Manchester, and one Loughborough and Nottingham (Midland Railway) services; Southport is served, according to traffic arrangements, either *viâ* Edge Hill or *viâ* Wigan; and Walsall obtains a through carriage at 11.20 a.m. from London, and at 5.52 p.m. from Stoke (North Staffordshire Railway).

Photo] [*R. W. Cole.*

GREAT WESTERN RAILWAY:

11 a.m. Bristol and "Bath Spa" Express.

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The Chinese Government Railways: Peking-Mukden Line.

WE have received from the directors a copy of the report of the Chinese Government Railways—Peking-Mukden Line—for the year ended December 31 last, which was the first year of the Chinese Republic. The railway has changed only in name from its original title of the "Imperial Railways of North China." Its administration remains unaltered, the Managing Director being Li Tsoi-Chee, and the Traffic Superintendent, a typical Irishman, Mr. J. S. Foley, who has spent a quarter of a century in the East, and gained the unstinted confidence of the Chinese.

It is explained in the report that from the beginning of the Revolution, and before the creation of a form of Republic Government, the country was in a chaotic state. For a time railway operations were carried on only at great personal risk and danger. In consequence, the loss sustained by the line was considerable. After the historic change had been successfully made, and although order had been somewhat restored in the country, Manchuria was visited with famine. Inundations broke out in the Province of Chihli, resulting in a general depression of trade throughout that part of the country. The traffic was then so stagnant that hope was almost given up of being able to bring the earnings to the usual figures of previous years, but, thanks to the untiring efforts and energy of the entire staff, on the general revival of trade, an unprecedented result was obtained. Besides grain, the earnings from coal traffic and salt show most notable increases. The traffic earnings for 1912 are the highest on record for the railway. Results of the year's working as compared with those of the previous twelve months are as follow:—

	1911	1912
	$	$
Earnings	11,668,627·89	13,183,638·51
Working Expenses ..	3,651,132·53	3,820,657·23
Balance after paying Working Expenses	8,017,495·36	9,362,981·28
Ratio of Working Expenses to Earnings	31·3%	28·9%

The mileage open to traffic is 605·76 miles; train miles run for revenue in the year were 2,273,243 (for construction and maintenance 83,862); the number of passengers carried was 3,495,707; the freight, 3,450,393 tons; the passenger mileage, 271,554,996; ton mileage, 299,419,493; and the total "passenger ton" mileage, 570,974,489. At the Tongshan Works, Kao Pan Tze shops and the locomotive sheds the average number of employés is 4,508, and of these 2,836 (including 1,131 in the police force) are under Mr. Foley's personal control.

At the end of last year the freight stock consisted of 2,974 cars, ranging in capacity from 10 tons to 30 tons, and representing a total tonnage of 60,251. There were 302 passenger cars, including 26 cars in the *train de luxe* equipment. The following particulars are given of the locomotives and tenders in use at that date:—

ENGINES.

Passenger Class:—				
4–4–0	Cylinder	17″ × 24″	4	
4–4–0	Cylinder	19″ × 24″	3	
4–6–0	Cylinder	18″ × 24″	13	20
Freight Class:—				
2–6–0	Cylinder	17″ × 24″	43	
2–6–0	Cylinder	19″ × 24″	14	
2–6–0	Cylinder	16″ × 24″	27	84
Shunters:—				
2–6–2	Cylinder	14″ × 24″	13	
0–6–0	Cylinder	16″ × 24″	4	
2–6–4	Cylinder	17″ × 24″	2	19
		Total Engines		123

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Tenders.	
4 Wheel	3
8 Wheel	83
6 Wheel	26
Total Tenders	112

Following is a comparative table of the rolling stock :—

	1911	1912
Passenger Cars and Brake Vans	294	302
No. of Axles ..	1,068	1,098
Freight wagons of all classes ..	2,868	2,974
Tonnage capacity ..	57,831	60,555
Locomotives of all classes ..	124	123
Weight in Tons ..	5,667	

Note :—Four Freight cars added to list hitherto not on register.

All who have an opportunity of reading the report will recognise the spirited and advanced policy governing the administration of the railway in Chinese-British hands. Its new rolling stock includes five first-class drawing room cars, three first-class sleeping cars, one first-class dining car, and one second-class sleeping car. There are also under construction six first-class coaches, four postal vans, one kitchen car, one first-class sleeping car, and a second-class dining car with kitchen. New freight stock added last year consisted of fifty 20-ton covered goods wagons, fifty 30-ton high-sided wagons and fifteen 24-ton high sided wagons mounted on old spare bogies. Some of the difficulties experienced in the management of railways in China are revealed in the following paragraphs, which we find in the locomotive and carriage report :—

Owing to the unsettled state of the country early in the year, and the large number of unemployed Southerners in Tongshan in poor circumstances, who showed no signs of moving to other places owing among other reasons to there being no, or very little, demand for labour anywhere in China, it was decided to re-engage these men in the railway works and so avoid the risks of local disturbance. To find these superflous hands work, six 19″ mogul engines were put in hand with what material was in stock. Boiler tube fencing, electric light standards, and other work not calling for any great degree of skill were also undertaken. Delay was caused to a lot of work put in hand during the year, owing to the unusual length of time taken to fill indents calling for material from England attributable to the succession of strikes in that country. As regards locomotives the six mentioned above were put in hand, two of which are to be fitted with the Phœnix superheater. Owing to the delay in receiving material, it is improbable the first of these will be on the rails before June, the others following at intervals of a month. A shunting engine in every possible respect similar to the standard light mogul engine was ordered from the North British Locomotive Company. It is hoped that this engine may be adopted as the standard heavy shunter required by the line. The fitting of train engines and 74 class with train heating gear was proceeded with, so before long the boilers carried for this purpose in the brake vans may be dispensed with and the space utilised for baggage.

British capital has done a great deal towards providing and equipping this great Chinese line, which has now entered upon the most eventful period of its history, and we are sure that readers of the RAILWAY MAGAZINE will welcome even a brief record of its remarkable progress.

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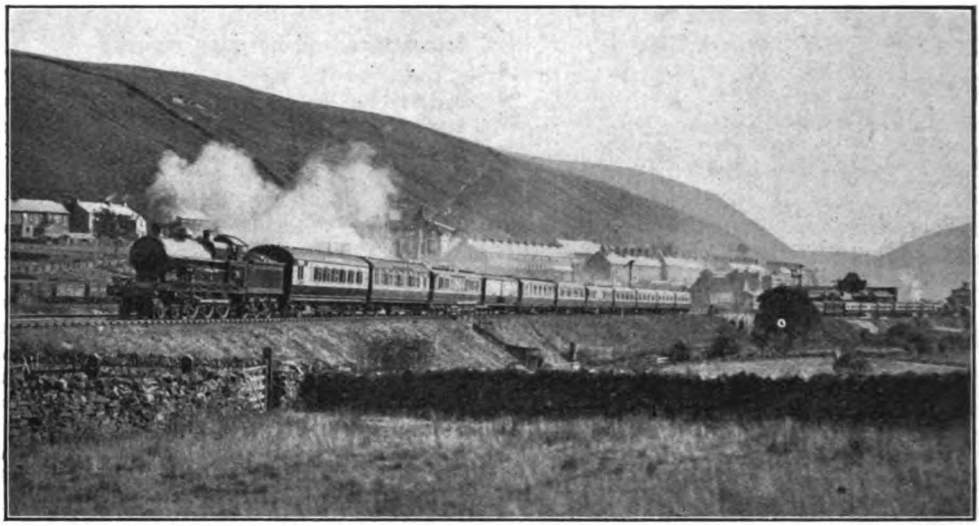

Photo] [*F. E. Mackay.*

LONDON AND NORTH WESTERN RAILWAY:
10 a.m. down West Coast Express passing Tebay. Four-cylinder 4–6–0 (Schmidt Superheater) locomotive, No. 163, *Holland Hibbert.*

British Locomotive Practice and Performance.

By CECIL J. ALLEN.

BY the courtesy of Mr. Francis H. Dent, General Manager of the South Eastern and Chatham Railway, I have recently been afforded an opportunity of securing some further records of the locomotive work on that line—performance always consistently good and sometimes brilliant. Much has been written in the past of the difficulties experienced on the main lines. Grading has generally been considered the worst obstacle to high speed running. On the Chatham and Dover main line to Dover *viâ* Chatham and Faversham, the gradients are certainly very trying, the continual switchback of inclines, some of fair length, and almost all uniformly at 1 in 100, seriously hampering trains with loads at all heavy.

As regards the original South Eastern main line, I am, however, inclined to think that the difficulties in this respect are sometimes a little over-rated. The "pull" up to Knockholt from New Cross on the one side or from Tonbridge on the other undoubtedly involves hard "collar-work," but this is more on account of the length of the grade than its undue severity. There is no gradient steeper than 1 in 120 on either climb. At this inclination is found a length of 2¼ miles culminating at Elmstead Tunnel, another of 1¾ miles up to Knockholt, and 4 miles further from the eastern portal of Sevenoaks Tunnel down to Tonbridge—a total, therefore, of 4 adverse miles at 1 in 120 in each direction. Although on the down journey the 12 miles from New Cross to a point just beyond Knockholt are continuously adverse, the only other grade worth mentioning is the 1½ miles' length at 1 in 140 past Hither Green. Up trains are more severely hampered in that the 1 in 120 of Hildenborough bank is succeeded by 2 miles at 1 in 144 through Sevenoaks Tunnel, and then, after the short drop of 1¾ miles at 1 in 160 to Riverhead, by the further 3¾ miles at 1 in 143 up to the west end of Polhill Tunnel, ½ mile east of Knockholt.

The chief difficulty to me seems to lie in the loads hauled, which for the type of engine employed are really heavy, and seriously affect the locomotive performance, particularly on the up journey. Even such a comparatively moderate rise as 1 in 265, when extended for 12 miles from the commencement of a journey—as is the case from

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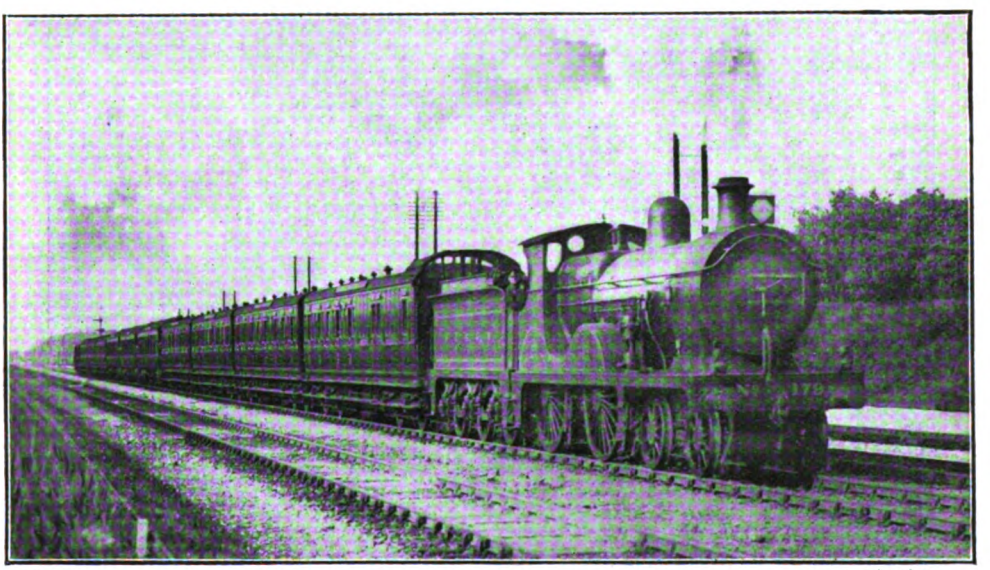
Dover up to Westenhanger—tells heavily against a 4–4–0 engine, of comparatively moderate dimensions, hauling a load of, say, 46 axles or more, while the bank from Tonbridge, started under the hampering influence of the slack through that station, assumes tremendous proportions in similar circumstances. On the down journey, however, the work to be preformed is much easier, as, after the ascent to Knockholt, there comes the rapid descent to Tonbridge, followed by a further gradual descent to Paddock Wood, which aids the recovery from Tonbridge slack and gives the trains a good impetus for the gentler undulations which continue to Folkestone and Dover. The main line *viâ* Tonbridge might, therefore, be fairly termed a hard route for up trains—particularly the heavy boat expresses—but I do not think it could be considered exceptionally difficult where down trains are concerned.

In the matter of speed it will be freely admitted that the South Eastern and Chatham Railway has during recent years made wonderful strides. The best short distance "spurts" are naturally in evidence on the straight and easily-graded portion of the main line east of Tonbridge, and some of these are really brilliant. Such a time, for instance, as 29 min. for the 26¾ miles from Tonbridge to Ashford, as made by the 11.20 a.m. *ex*-Tonbridge, overshadows the Hitchin-Huntingdon run of the Great Northern Railway—a similar distance covered in the same time—as in the latter case the gradients are favourable almost throughout. This involves an average speed of 55·2 miles per hour, and in addition, times of from 30 to 32 min. in each direction between the same two points are common, the average speed in each case exceeding 50 miles per hour. The first-mentioned train also proceeds to cover the 14 miles from Ashford to Folkestone Central in 16 min., another exceedingly smart run. Between Paddock Wood and Ashford excellent journeys are made, one down train covering this 21¼ miles in 24 min., at 53·1 miles per hour, and several others, both down and up, in 25 min., giving an average of 51·0 miles per hour. Such times as these leave nothing to be desired, even as judged by the standards of lines specially adapted for high speed running.



Photo] [*F. E. Mackay.*

SOUTH EASTERN AND CHATHAM RAILWAY:
2.5 p.m. down Continental Express. Belpaire locomotive, No. 179.

But the long-distance runs on the South Eastern and Chatham Railway show equal improvement. Attention has often been called to the 90-minute bookings over the 74 miles between Victoria and Margate, which, even with the lightest of loads, are a striking example of what can be done in face of such formidable obstacles as exist in the grading and alignment of this route. Improvements also continue to be effected in the Folkestone and Dover services,

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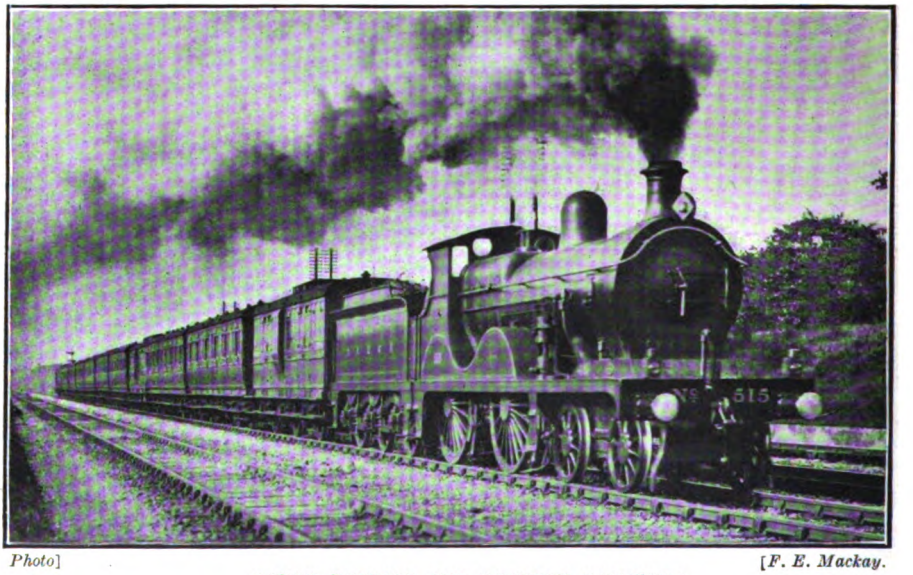
timings of 84 min. being now in force in each direction between Cannon Street and Folkestone Central—68¾ miles. This run compares closely with the Great Eastern Railway 84-minute summer booking to Ipswich, over an identical distance, although the latter involves perhaps a little harder work, especially when exceptional week-end loads are being taken. Beyond all these, however, in addition to the excellent timings of the heavy boat expresses, the South Eastern and Chatham Company has this year instituted two remarkable bookings. The first is that of the cheap Sunday excursion train scheduled to cover the 60¼ miles from Redhill to Canterbury (West) in 70 min.—the average of 51·7 miles per hour over this route being reminiscent of the old crack South Eastern competitive times from London to Margate, in days prior to the opening of the direct line to Tonbridge *viâ* Chislehurst. The second, or better known "flier" is the new 4.30 p.m. down Continental express *ex*-Charing Cross, which for the first time has brought Dover within 90 min. of the Metropolis.

Naturally enough, the 4.30 p.m. boat express was one of the trains that I elected to time. Most of the comments that have appeared in connection with the booking of this train have given the distance covered as one of 76½ miles, whereas this is merely the distance from Charing Cross to Dover Town station. But Dover Town is a point vastly different, as regards journey time, from Dover Pier, seeing that the boat expresses are now taken through to the extreme end of the Admiralty Pier, over a tortuous piece of line at an exceedingly cautious rate of speed. "Bradshaw" gives the distance between the two stations as *nil*, but at the present time the Pier must be fully ¾-mile from the Town station, making the total journey from London one of 77¼ miles, and the average speed throughout one of 51·5 miles per hour. Considering the character of the line between Charing Cross and London Bridge, and from the Town to the Pier stations at Dover, this is, therefore, a very fast and creditable schedule. On the occasion of travelling the load consisted of three 60-ft. coaches, two Pullman cars and a six-wheeled van, weighing with passengers 170 tons. The engine was a Belpaire 4–4–0, No 176, capably driven by J. Smith, who has on previous occasions given me excellent runs over the same route.



Photo] [*F. E. Mackay.*

SOUTH EASTERN AND CHATHAM RAILWAY:
2.20 p.m. Ostend Boat Express. Belpaire locomotive, No. 515.

As is customary, the speed on the winding 1¾ miles out to London Bridge was very moderate, this initial 1¾ miles taking 4¾ min. But once through the latter station No. 176 got away in fine style, passing New Cross at 56·3 miles per hour. At Elmstead Tunnel our rate had not fallen below 41·7 miles per hour, and after improving finely on the 1 in 310 past Orpington to 51·7, it

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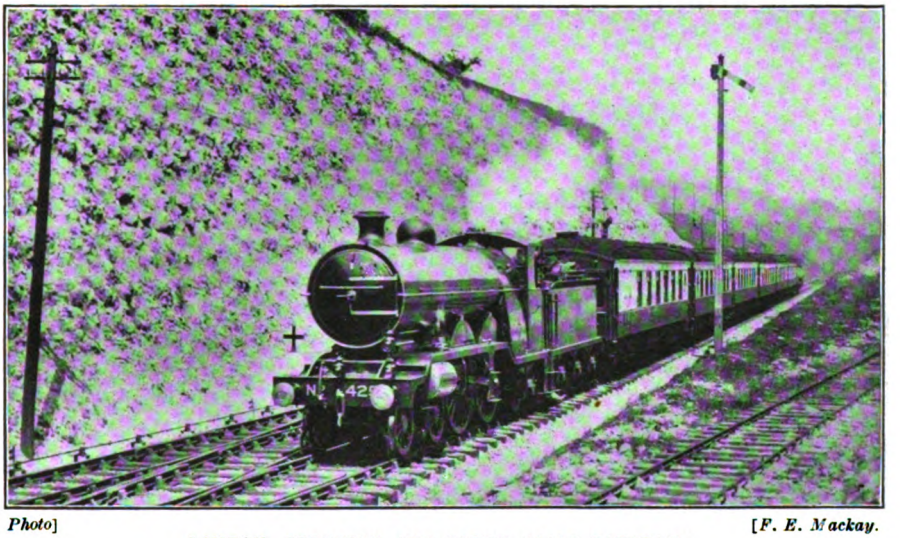
fell again to 41·7 on the second stretch of 1 in 120 which ends at Knockholt. In this way some excellent uphill times were made. The 5 miles from Charing Cross to New Cross had taken 8 min. 40 sec., but the 6¼ uphill miles thence to Chislehurst occupied only 7 min. 55 sec., and the 5¼ miles thence up to Knockholt 6 min. 55 sec., the total time from Charing Cross to Knockholt, 16½ miles, being therefore 23½ min. It is worthy of note, as indicating that the engine was working well within her powers, that steam was blowing off lustily up the bank from New Cross until we had passed Hither Green. Driver Smith did not now indulge in any excessive downhill speeds, the average rate to Dunton Green and beyond Sevenoaks hand, there was now perhaps a barely perceptible "easing off" in the speed on the gentle undulations which follow. At Staplehurst we had dropped to the mile-a-minute rate, but accelerated again to 66 miles per hour near Headcorn. On the gradual succeeding rise to Pluckley, however, a minimum of 53·6 was reached. For all this, however, only 26 min. 55 sec. had been occupied in covering the 26½ miles from Tonbridge to Ashford, making the total time for the 56 miles from London 63½ min. Through Ashford we ran at 58·4 miles per hour, and then took the gentle rise to Westenhanger under comparatively easy steam, speed falling to within a fraction of 50 miles per hour at the summit. Down the



Photo] [*F. E. Mackay.*

LONDON, BRIGHTON AND SOUTH COAST RAILWAY:

Down "Southern Belle" near Coulsdon. 4–4–2 (Schmidt Superheater) locomotive, No. 425.

Tunnel ranging round 68 or 69 miles per hour, although 70·3 was touched in the neighbourhood of Hildenborough. With a minimum speed of 57·7 miles per hour at Sevenoaks Tunnel entrance, and a careful slack approaching Tonbridge, our time for the 13 miles from Knockholt to Tonbridge was 13 min. 5 sec.; the total time from Charing Cross to Sevenoaks, 22 miles, was 29 min. 10 sec., and to Tonbridge, 29½ miles, 36 min. 35 sec.

Accelerating rapidly from Tonbridge, a maximum rate of 67 miles per hour was attained at Paddock Wood, which settled down to a steady 66 thence to Marden. At this point the engine had once again started blowing off, and, as we had time well in gradual descent to Folkestone speed was again moderate, not rising beyond 64·3 miles per hour, after which steam was shut off. Nevertheless, Folkestone Central station, 70 miles from Charing Cross, was passed in the remarkable time of 78 min. 10 sec. The 53½ miles from Knockholt to this point had been covered in 54 min. 40 sec., and under easy steam throughout. Unfortunately, now a slight signal check at Folkestone Junction was succeeded by a dead stand in the Warren. Consequently, although we passed Dover Town in 89½ min. from London, our arrival on the Pier was 1 min. 20 sec. behind time—an unfortunate ending to a really fine run, on which time had been well in hand throughout. Without delays, we should

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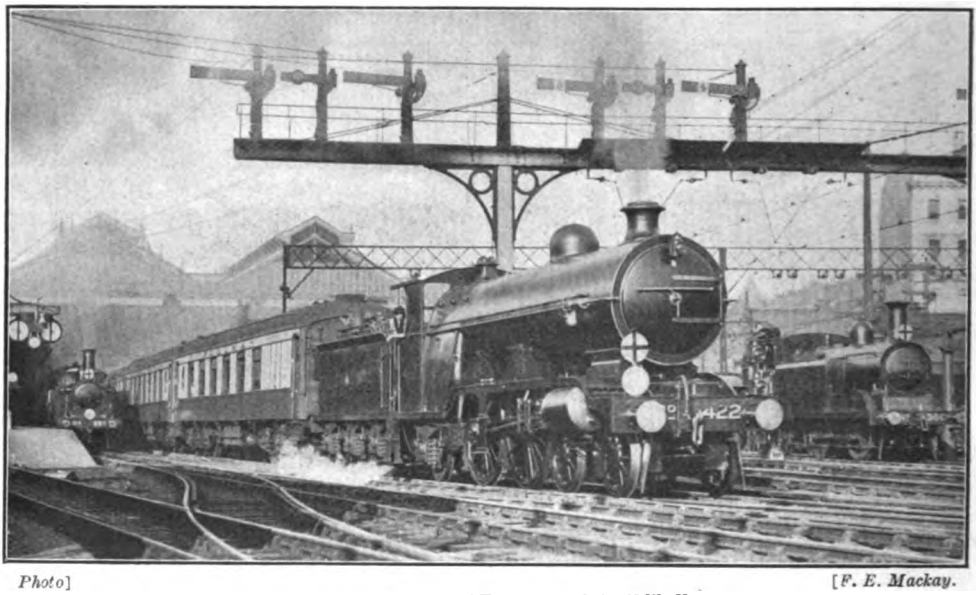
easily have passed Dover Town in 84 min. 40 sec. from Charing Cross, and have stopped on the Pier in 86½ min. from the start—an achievement of which Driver Smith might well be proud. As will be seen, even the latter time could have been considerably improved upon by faster running from Paddock Wood and Staplehurst.

On my second down journey, having occasion to be travelling to the Continent, I made for Charing Cross with the object of catching the 9 a.m. down boat express for Dover, and must own for once to being "caught napping." The boat train itself was very full, and other fellow-travellers and myself were lured into a "relief," we were either actually checked, or had steam off and were whistling for signals on account of the train in front, almost throughout the journey, so that there was no real opportunity of recording the engine's full capabilities. For all that, however, the running with this load of about 305 tons was consistently good throughout.

From Cannon Street we were checked badly all the way to New Cross, taking 8¼ min. for the 3¾ miles. Up Hither Green bank the engine was obviously working under easy steam, as the speed fell to a steady 28·3 miles per hour on the 1 in 120 approaching Elmstead Tunnel, so that the time from New Cross to Chislehurst was



Photo] [*F. E. Mackay.*

LONDON, BRIGHTON AND SOUTH COAST RAILWAY:
"The Southern Belle" (seven cars) leaving Victoria. 4–4–2 (Schmidt Superheater) locomotive No. 422.

which was to start at 8.53 a.m., and by the aid of which we looked forward joyfully to securing the best places on the boat in arriving at the pier first. Our chagrin may be understood when we discovered, after starting, that our "relief" train was proceeding round to Cannon Street to attach the mail portion, whence we *followed* the 9 a.m. express from London Bridge onwards! However, my feelings were much mollified when I discovered that our engine was No. 275, one of the only two superheater-fitted 4–4–0 engines on the South Eastern and Chatham Railway, while the load also reached the respectable total of 10 eight-wheelers and 2 six-wheelers. Unfortunately

10 min. 55 sec. Whistling for signals and slight checks marked the remaining 5¼ miles of the ascent to Knockholt, which occupied 10 min. with a minimum speed of about 25 miles per hour at the summit. The 15¼ miles from Cannon Street to Knockholt had thus occupied 29 min. 10 sec. At Riverhead we were running at 64·3 miles per hour, reduced on the up grade past Sevenoaks to 46, and then took the descent to Tonbridge quite briskly, passing Hildenborough at 72·5 miles per hour. This burst of speed brought the inevitable signal check—a severe one—outside Tonbridge, so that our time from Knockholt was 15 min. 25 sec. At Paddock Wood we had again reached

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66 miles per hour, and made such good speed over the 26½ miles from Tonbridge to Ashford, despite several further slight checks, that this distance only occupied 29 min. 50 sec. On the slight ascent to Westenhanger speed fell to a minimum fractionally under 45 miles per hour, and then again rose to 66 at Shorncliffe. The 14 miles from Ashford to Folkestone Central occupied only 15¾ min., and the final 6½ miles into Dover Town 7 min. Consequently, with all checks, we had passed Folkestone in 90 min. 10 sec., or only 70 sec. over the scheduled time of the American Car Train, and had reached Dover Town in 97 min. 10 sec.—2 min. 10 sec. in excess of booked time. Obviously the net time was considerably less, and it is significant that the 60 miles from Knockholt to Dover, with one

Photo] [*E. S. Hallett.*

LONDON, BRIGHTON AND SOUTH COAST RAILWAY:
9.20 a.m. Brighton–London Bridge train, drawn by rebuilt 4–4–0 locomotive, No. 317.

severe and several slight signal checks, took only 68 min., or, probably, about 65 min. net. Rumour has it that this engine is doing consistently good work, and is amply justifying the provision of the superheater.

Returning from abroad I had an opportunity of timing the 1.40 p.m. express from Folkestone Harbour to London, which is allowed 105 min. for the journey to Charing Cross, including the necessary reverse at Folkestone Junction. The load on the occasion in question consisted of 8 eight-wheelers of the latest 60 ft. stock, 2 Pullman cars and 2 six-wheeled vans, with every seat occupied and a large quantity of luggage, so that the total weight behind the tender must have been fully 345 to 350 tons. Starting late, we had a generous allowance of locomotive power from the Harbour up the steep grade to the Junction station at Folkestone, no fewer than three 0–6–0 tank engines being attached, two in front and one in the rear. This short journey took 3 min. 35 sec., and exactly 3 min. later we started on the journey of 71¼ miles to Charing Cross, hauled by the Belpaire 4–4–0 engine No. 179. We passed Folkestone Central, 1¼ miles from the start, in 3¾ min., and then mounted steadily up the 1 in 265 to Westenhanger at an average rate of 37·2 miles per hour, passing the latter point, 7 miles from starting, in 13 min. 35 sec. The next 8¼ miles to Ashford, gradually falling, took 8½ min., and an excellent speed was then maintained with this heavy train over the undulating stretch beyond, with a maximum rate of 65·2 miles per hour, and a time of 21 min. 20 sec. for the 21¼ miles from Ashford to Paddock Wood. On the rising grade to Tonbridge the speed had fallen to 47·4 miles per hour before we slacked, so that the 5¼ miles from Paddock Wood to this point took 6 min. 20 sec., making a total of 27 min. 40 sec. from Ashford, and 49¾ min. for the 41¾ miles from the start.

Commencing the ascent of the Hildenborough bank, the speed on entering Sevenoaks Tunnel, at the top of the 1 in 120, had fallen to 26·8 miles per hour, and dropped still further in the tunnel—as is often the case—to 26·5, although the grade had eased to 1 in 144. The 7½ miles from Tonbridge to Sevenoaks took 14 min. 55 sec., and after touching 54·2 miles per hour at

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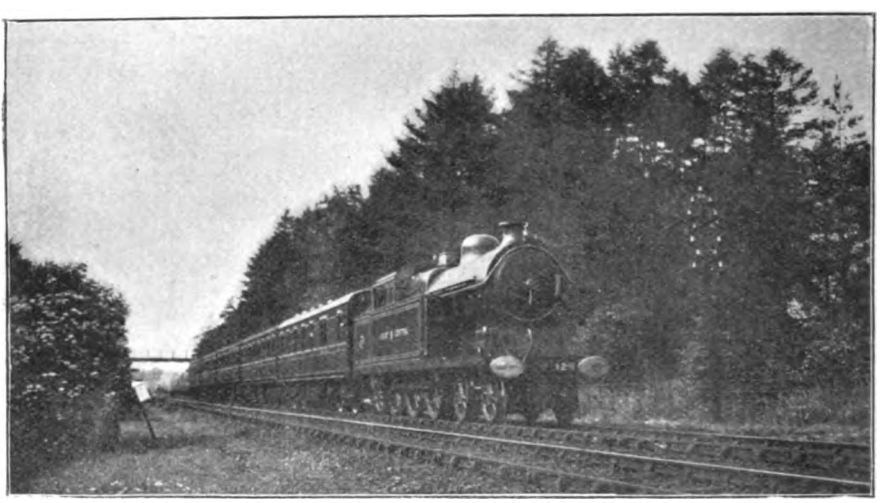
Riverhead, we ascended the Dunton Green bank in good style until entering Polhill Tunnel, in the passage of which the rate fell from 41·8 to 31·9 miles per hour, although the grade is an unbroken 1 in 143. So the 5½ miles from Sevenoaks to Knockholt took 7¾ min. making a total of 22 min. 40 sec. for the 13 miles from Tonbridge, and 72 min. 25 sec. for the 54¾ miles from the start. The falling grades to New Cross were taken fairly rapidly. A speed of 68·1 miles per hour was attained before we were checked by signal approaching Hither Green; 12 min. 10 sec. were spent on the 11½ miles from Knockholt to New Cross, and 4 min. 10 sec. on the 3¼ miles thence to London Bridge, which we passed in 88¾ min. from Folkestone Junction. But we were not to have a clear run in, as we were stopped dead in the neighbourhood of Waterloo Junction, thereby losing again almost all the time that had been regained. Finally Charing Cross was reached, 7½ min. after passing London Bridge, in 96¼ min. from Folkestone Junction (71¼ miles), and 102 min. 50 sec. from Folkestone Harbour, so that, both delays included, over 2 min. had been made up. The net time, however, was substantially less, being certainly not more than 98 min. from the Harbour (7 min. under scheduled time, and 2 min. less than the booked time of the 9.5 p.m. *ex* Folkestone), and 91½ min. from Folkestone Junction. Consequently this might fairly be classed as a fine run, when the heavy load is duly taken into consideration.

I had one other up journey, which might have been finer still, had it not been so cruelly delayed *en route*. The engine was again No. 179, and the train the 7.55 p.m. up Ostend boat express from Dover, which, owing to the late arrival of the steamer, was travelling *viâ* Tonbridge instead of its usual route through Maidstone. For the third time in the course of my journeys we had a load of 46 axles—10 eight-wheelers and 2 six-wheelers; but as these were not all of the latest stock, nor unduly crowded, the load did not exceed 320 tons. This train calls at Dover Town and Folkestone Central, after which the interesting part of the run may be said to begin. On this run the initial work was decidedly finer than on the last-mentioned, as a steady speed of 44·1 miles per hour was maintained up to Westenhanger, this 5¾ miles taking only 10 min. A high speed was attained before Ashford, which was passed at 68·1 miles per hour, in 7 min. 55 sec. from Westenhanger (8¼ miles), while the subsequent 10¾ miles to Headcorn were covered in "even time." Thus we had completed the first 24¾ miles from the start in 28 min. 40 sec., and appeared likely to make record time, when my worst fears were realised in a severe application of the brakes approaching Staplehurst. I am fated evidently never to secure a good record on either this train or the immediately following boat express from Folkestone; with unerring regularity, whenever I travel by either of these trains, there comes the check and the ensuing dead



Photo] [*E. A. Gurney-Smith.*

GREAT CENTRAL RAILWAY:
Up Aylesbury train leaving Sandy Lodge. 4–6–2 tank engine, No. 129.

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Photo] [*J. H. Tomlinson.*

GREAT NORTHERN RAILWAY:
2 p.m. up Leeds Luncheon Car Express passing Beeston.
4–4–2 locomotive, No. 279.

stand for signals, either here at Marden, or at Paddock Wood, on account of the 7.45 p.m. "slow" from Dover, or the 8.43 p.m. from Ashford.

The check was renewed at Marden, still more severely, and we then passed the offending train standing in the loop road at Paddock Wood. Moreover, the slack at Tonbridge was exceptionally severe, although a speed of 28·1 miles per hour was attained before entering Sevenoaks Tunnel, increasing to 30 as we threaded it on the 1 in 140 grade. At Riverhead we touched 55 miles per hour, and then ascended Dunton Green bank in good style, not falling below 42·9 miles per hour at the south-east portal of Polhill Tunnel, although the rate fell to 33·1 at the further end. The delays, however, had sadly affected our times. No less than 23 min. 40 sec. had been expended on the 15¾ miles between Headcorn and Tonbridge, while the 13 miles thence to Knockholt occupied 22 min. 10 sec. From Knockholt we started to make a brisk descent, passing Chislehurst, 5¼ miles, in 5½ min., but even then we were not permitted a clear run into town, being checked almost all the way to London Bridge, and taking 16¾ min. for the last 9½ miles. Curiously enough, our gross time was still ¼-min. under the schedule time of this train between Folkestone Central and London Bridge—96¾ min. as against 97 min.—but we had, of course, taken the direct line instead of the circuitous and difficult route *viâ* Maidstone. It is hard to estimate a net time for the journey, but I should put it at about 84 min. for the 68¼ miles, which, considering the load, was distinctly creditable. Indeed, when the limitations of axle-load, which so restrict locomotive development on the South Eastern and Chatham Railway, are taken into account, it must be agreed that the locomotive performance on that line is uniformly very meritorious.

By the kindness of Mr. W. Forbes, General Manager of the London, Brighton and South Coast Railway, I have been afforded a similar opportunity of recording some locomotive work on the latter line. The London, Brighton and South Coast is another railway which has been making considerable strides in speed of recent years, while the time-tables of the larger systems have been more or less devoid of improvement. In the case of the Brighton line these accelerations have mainly consisted in levelling up the times of many of the expresses to the fastest existing standards, the only new timings of importance being the 85-min. bookings from Eastbourne to London. As, however, the previous 90-min. times to and from Eastbourne included in most cases a stop of several minutes' duration at Lewes or elsewhere, no appreciably altered running is involved in the 5-min. acceleration. Unfortunately, at the only time when I was able to make these runs, there was a very severe permanent way check in force, over both up and down roads, extending from the point where the new line crosses the old one beyond Coulsdon right through Merstham Tunnel to Quarry Box. Thus every run was well-nigh spoiled. A further engineer's slack was in evidence between Selhurst and East Croydon, constituting another hindrance.

Needless to say, two of the runs were made on the popular "Southern Belle" express, which always provides a good trip. Travelling down by the 11 a.m. express *ex*-Victoria, we had a load of 4 twelve-wheeled cars, weighing 160 tons, and hauled by a superheater 4–4–2 tank engine, No. 25. As early as Pouparts Junction, we

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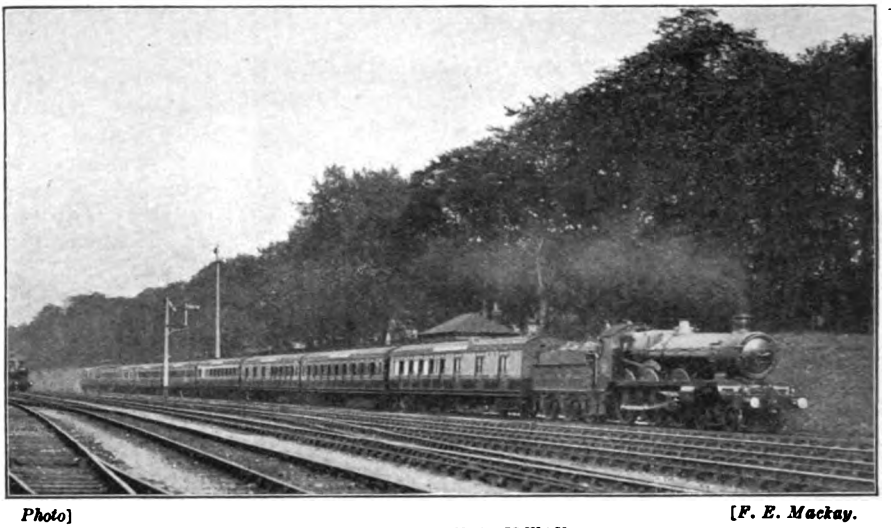

Photo] [*F. E. Mackay.*

GREAT WESTERN RAILWAY:

3.30 p.m. down Plymouth Dining Car Express. New 4–6–0 four-cylinder locomotive, No. 4041, *Prince of Wales.*

were checked slightly by signal, but passed Clapham Junction, 2¾ miles, in 5 min. 50 sec. On the ascent past Balham, the work was unaccountably sluggish, and speed fell as low as 36·3 miles per hour, although improving to 56·3 beyond Streatham, after which came the check approaching Croydon already mentioned. The 4 miles from Clapham Junction to Streatham took 5 min. 35 sec., and the 3¾ miles thence to East Croydon 4 min. 50 sec., making 16¼ min. in all for the initial 10½ miles. Speed recovered well up the rising grade to Coulsdon, the 4½ miles from Croydon to this point taking 5 min. 25 sec., but then followed the long permanent way check, which worked havoc with all my times. In this case the 6¾ miles from Coulsdon to Earlswood occupied 8 min. 35 sec., making our time from Victoria 30¼ min. for this 21¾ miles. I am aware that this is only 1¼ min. in excess of schedule time, but the latter is framed in such a way as to be unduly easy to this point, and rather "tight" beyond. At Horley we touched 69·2 miles per hour, but fell at Balcombe Tunnel to 45·5. At Haywards Heath we did not exceed 68·1, while up to Clayton Tunnel the work was poor, a minimum speed of 42·9 miles per hour being registered. Our intermediate times were: From Earlswood to Three Bridges, 7¾ miles, 7 min. 40 sec.; Three Bridges to Haywards Heath, 8½ miles, 9¼ min.; Haywards Heath to Preston Park, 11½ miles, 12 min. 25 sec.; and for the last 1¼ miles into Brighton, 2 min. 5 sec. The total time from London was, therefore, 61 min. 40 sec. for the 50¾ miles, or not more than 59 min. net. It is worthy of note that the 32 miles from Quarry Box to Brighton were covered in exactly the schedule time of 35 min.

For the return journey by the 12.20 p.m. *ex*-Brighton, one Pullman Car was detached, and two third-class coaches added, as this train now conveys third-class passengers. The engine for the run was a superheater "Atlantic," No. 422, and the total load about 175 tons. It must be confessed that the running did not at any point come up to the standard of my last year's timing on the same train, when we were hauled by a 4–4–0 engine, although it was fair throughout. We accelerated to 46·9 miles per hour at Clayton Tunnel, and had touched 69·2 on passing Burgess Hill. The first 9½ miles to Keymer Junction took 12 min. 55 sec. (scheduled 13 min.), and the 3¼ miles beyond to Haywards Heath 3 min. Ascending to Balcombe Tunnel our speed fell to 51·7 miles per hour, while an even 73·8 was sustained along the falling length past Horley. From Haywards Heath to Three Bridges the 8½ miles occupied 9¼ min., and the 7¾ miles thence to Earlswood 7 min. 10 sec. Some of the best work of the journey was performed up the 1 in 200 from Earlswood to Quarry, where the speed had not

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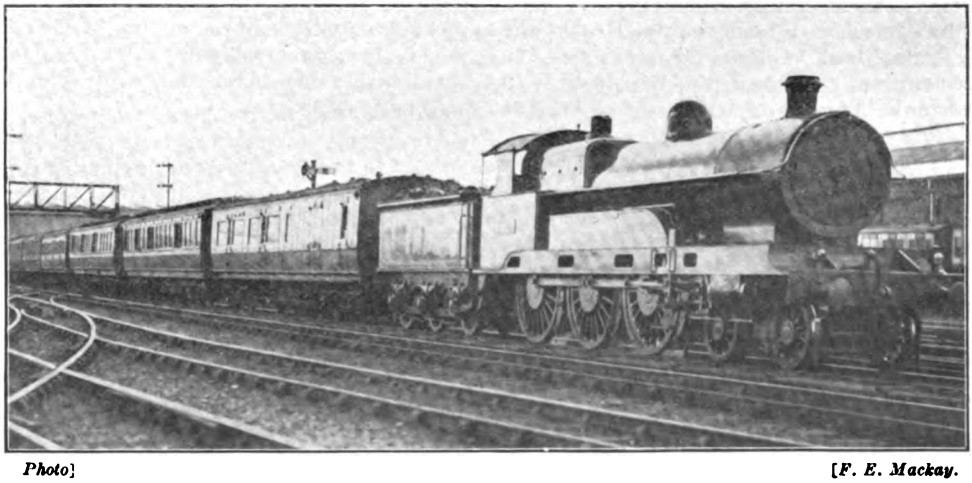
fallen below 52·9 miles per hour when the brakes were applied for the permanent way check. As in the reverse direction, we had kept dead time to this point, having covered the 32 miles from Brighton in 36 min. exactly. The slack proved more formidable in this direction, as we literally "crawled" for quite 2 miles, and expended no less than 7 min. 40 sec. over the 3¾ miles from Quarry to Coulsdon, instead of the 4 min. allowed. From Coulsdon to East Croydon the 4½ miles were covered briskly in 4 min. 20 sec., with a maximum speed of 66 miles per hour. Then followed the second permanent way check beyond Croydon, causing the 1¾ miles to Thornton Heath to take 2 min. 50 sec.; but we ran fast on to Clapham Junction, the 6 miles from Thornton Heath taking only 6 min. 10 sec. We were checked severely again at Pouparts Junction, and ran slowly up the platform on arrival at Victoria, having occupied 4¼ min. on the last 2¾ miles. Nevertheless, the total time from Brighton was only 61¼ min., while I estimate the net time at 56½ min. for the 50¾ miles. Although 20 min. are allowed from Coulsdon to Victoria, we did well to cover this 15 miles in 17 min. 35 sec., or not more than 16 min. net. With a clear run from this point we should probably have arrived to time.

I had no opportunity of timing an 85-minutes' express on the Eastbourne service, and so contented myself with a run on the 11.15 a.m. *ex*-Victoria, which is scheduled 90 min. for the run, with a 1-min. stop at Lewes. The load totalled 8 eight-wheelers, including a Pullman Car—about 200 tons with passengers and luggage—and the engine was again a superheater 4–4–2 tank, No. 78. We cleared Clapham Junction in 5 min. 50 sec., as with the "Southern Belle," but did better up to Balham, despite the heavier load. At this point a signal check intervened, so that the 4 miles from Clapham Junction to Streatham took 5 min. 55 sec. We also slacked more severely before East Croydon, and the 3¾ miles from Streatham took as much as 6 min. 35 sec., making our total time to this point 18 min. 20 sec. From East Croydon to Coulsdon the 4½ miles took 5 min. 50 sec., and the permanent way check was then observed most rigorously, no less than 10 min. being spent on the 6¾ miles from Coulsdon to Earlswood. Thus our first 21¾ miles to Earlswood had taken 34 min. 10 sec. But some fine work followed. A top speed of 68·1 miles per hour was touched at Horley, and the incline to Balcombe Tunnel was breasted at a minimum rate of 51·7, followed by another spurt of 67 miles per hour past Haywards Heath. The 7¾ miles from Earlswood to Three Bridges took 7 min. 40 sec., and the 8½ miles on to Haywards Heath 8 min. 55 sec.

A misfortune then befel us in the shape of a severe signal check at Wivelsfield, which brought us down to a walking pace. Otherwise we should have reached Lewes on time, despite all delays. The 3¼ miles from Haywards Heath to Keymer Junction



Photo] [*F. E. Mackay.*

LONDON AND NORTH WESTERN RAILWAY:

Up Express leaving Willesden Junction. New four-cylinder locomotive (Schmidt Superheater) No. 1327, *Alfred Fletcher.*

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took 3 min. 55 sec., and the final 9¾ miles into Lewes 12 min., with a maximum of 63·8 miles per hour at Cooksbridge. It was surprising to arrive only 1 min. 40 sec. late after all these delays, having taken 66 min. 40 sec. for the 50 miles. I estimated the net time as not exceeding 60½ min. at most. After leaving Lewes, Polegate, 11½ miles, was passed very slowly in 15 min. 20 sec., and the last 4¼ miles into Eastbourne were run gently in 6 min. 50 sec., the total time of 22 min. 10 sec. for the 15¾ miles showing an economy of nearly 2 min. on schedule time. Our actual gross running time from London, therefore, omitting the duration of the Lewes stop only, was 88 min. 50 sec. against 89 min. booked, but the net actual running time did not exceed a fraction over 83 min., or, say, 82 min. if the slowing up for and starting from Lewes were allowed for.

On the return journey I utilised the 2.25 p.m. *ex*-Eastbourne, which is a heavy train with portions for both Victoria and London Bridge, and is allowed only 72 min. for the 55¼ miles to East Croydon. We had quite a heavy load of 12 eight-wheelers, one a Pullman Car, weighing some 305 tons in all, and hauled by a superheater "Atlantic," No. 424. Polegate, 4¼ miles, was passed in 7 min. 40 sec., and the 11½ miles thence to Lewes were covered in 13 min. 40 sec., with a sustained speed of 66 miles per hour past Glynde. The usual cautious slack was made at Lewes, followed by one almost equally careful at Keymer Junction, the 9¾ miles between these points occupying 12¾ min. From Keymer to Haywards Heath the 3¼ miles took 4 min. 50 sec., and the acceleration continued up the incline to Balcombe Tunnel, on which the speed was sustained for some distance at 50 miles per hour—a really excellent feat—dropping, however, to 47·4 in the tunnel itself. Up to this point the work had been commendable, and, despite the bad check ahead, we seemed likely to keep schedule time without difficulty, but down the tempting incline to Horley we never exceeded 63·8 miles per hour, whereas on the ascent to Quarry, which was breasted just previously on the "Southern Belle" at a minimum of 52·9 miles per hour, the speed actually fell to 36 miles per hour! So our time from Haywards Heath to Three Bridges, 8½ miles, was 10 min. 20 sec.; from Three Bridges to Earlswood, 7¾ miles, 8 min. 5 sec.; and from Earlswood to Quarry, 3 miles, 4 min. 50 sec.! After this came the long permanent way check, slower on this run than ever, 8 min. being taken for the 3½ miles to Coulsdon, and finally, a time of 5 min. 10 sec. for the 4½ miles from Coulsdon to the stop at East Croydon. In this way 3 min. 20 sec. had been lost, and most inexcusably so, as, with such early promise, the run should have been completed easily in schedule time, although without the permanent way check the net time would be almost exactly the 72 min. allowed. The remainder of the run calls for little comment. With a reduced load of 210 tons, the 7¾ miles to Clapham Junction stop were covered in 12 min. 5 sec., or 11 min. net (owing to a signal check at Wandsworth), and the last 2¾ miles into Victoria in 6 min., where ½ min. of the arrears had been regained. On the whole, however, this was a disappointing run. It will be noticed that time was not actually kept on any one of the runs timed, but circumstances were decidedly against the due maintenance of schedule on almost every trip.

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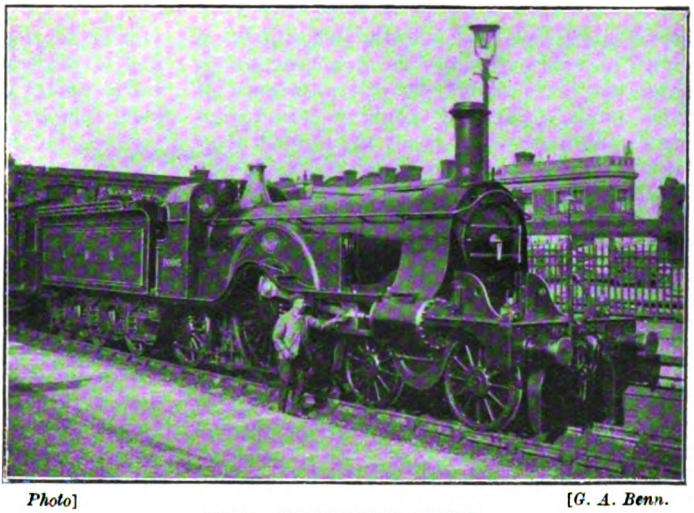
Some Famous British Single-wheelers.

By

MAURICE D. SARGEANT.



Photo] [*G. A. Benn.*

GREAT NORTHERN RAILWAY.

8 ft. single engine No. 1008 at Finsbury Park.

"IN all things, but proverbially in mechanism, the supreme excellence is Simplicity."

The truth of the above oft-quoted *obiter dicta* of the great James Watt is perhaps no where more clearly exemplified than in the design of British locomotive engines. Simplicity, with its attendant characteristics of durability and economy, has always been the aim of locomotive designers in this country, and possibly in no type of engine has this combination been more readily attained than in the various types of "Single-wheelers" which for so many years performed the fastest express work on our great trunk railways. Indeed, it is no exaggeration to say that the reputation deservedly enjoyed by the Great Northern, Great Western, and Midland Railways for sustained high speed may be largely attributed to the past performances of their various designs of singles.

Although the inexorable law of mechanics which determines the haulage capacity of a locomotive as a function of the weight upon the driving wheels has necessitated the abandonment of the type in favour of coupled engines with their necessarily greater adhesion and tractive power, it is questionable whether as regards economy in working, low fuel consumption, and absence of breakdowns, it is possible to point to a locomotive type which has been more generally successful within the limits of its capacity. Singles have been popular alike with locomotive engineers and railwayists, and the numbers placed in service by those railways where they were systematically employed is proof of the efficiency with which they performed their duties ere train loads had grown to modern dimensions. However, their day is now admittedly past, no engines of the type having been built for English railways for some 11 years, and therefore in view of their rapid extinction the present seems a favourable opportunity for placing on record some description of the more famous single-wheelers, specimens of which are still to be found at work.

The pages of this magazine have borne such eloquent testimony to the splendid work done by this type on various occasions, that it is hardly necessary to give a detailed account of performances, and a few instances of the work of each representative engine must therefore suffice. To allow of ready comparison of dimensions, tractive power, etc., a detailed table is appended giving the leading particulars of the locomotives dealt with.

Pride of place amongst single-wheelers must for all time be allotted to the famous "eight-footers" of the Great Northern Railway. These splendid machines gained for this system a reputation second to none for high express speeds; and probably no engines, with the exception perhaps of the broad gauge eight-footers, ever made such a strong appeal to the popular imagination. The design, though not absolutely unique, was conceived on such generous lines, and the immense driving wheel diameter (the largest with three exceptions ever utilised for a passenger engine engaged in regular

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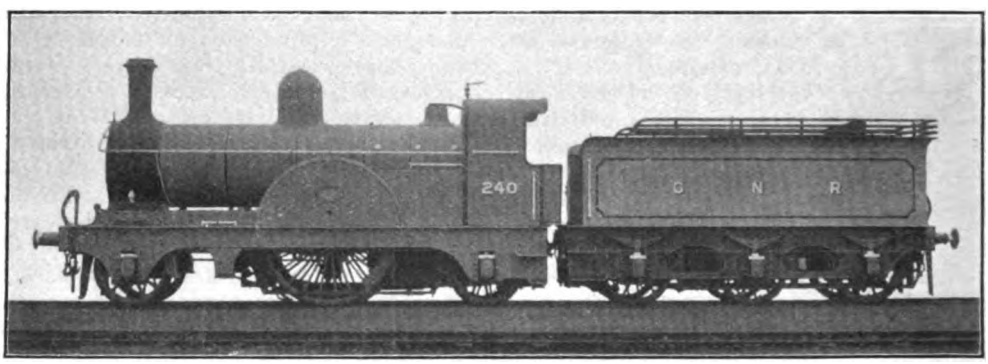
traffic), the long piston stroke in conjunction with outside cylinders, the domeless boiler, and the stern simplicity of appearance of the engines, evoked genuine admiration from engineers throughout the world; and it is a striking testimony to their efficiency that from 1870 to 1897—a period of some 27 years—they were found capable of performing the fastest express work on the Great Northern Railway.

The late Mr. Patrick Stirling had constructed two classes of express engines for dealing with the Great Northern traffic, both six-wheel types, one with single driving wheels 7 ft. diameter, and one with coupled wheels 6 ft. 6 in. diameter, and the results of their working with the train loads of those days had resulted in the singles proving the most economical in coal consumption and repairs on the fastest work. When, therefore, in 1869 the provision of more



2–2–2 SINGLE LOCOMOTIVE: GREAT NORTHERN RAILWAY.

powerful locomotives became urgent, he decided to build them of the single-wheel type, and in order to obtain low piston velocity at high speeds and the maximum adhesion he adopted 8 ft. 1 in. as the diameter for the driving wheels. To obtain sufficient tractive force with such large wheels, a 28-inch piston stroke was utilised, which in conjunction with 18-inch cylinders gave a tractive effort of 94·5 lbs. for each pound of mean effective pressure in the cylinders. The rooted antipathy to high centres of gravity then prevalent with most locomotive engineers, necessitated his placing the cylinders outside the frames to avoid pitching the boiler centre at what would have been then considered an undesirable altitude. The boilers, which had a maximum diameter of 4 ft. 2 in. outside the largest ring, were pitched accordingly with their centre lines 7 ft. 3½ in. from rail level.

Owing to the great weight at the leading end, a bogie was provided which had some novel points of design. It was built up of steel plates and braced with four cross frames, and independent springs were provided to each axle box. No cross traverse was given to the bogie pin, but this pin was placed 3 in. to the rear of the centre of the bogie wheel-base, which had the advantage of placing a greater proportion of the weight on the rear wheels than was borne by the front wheels, and thus the weight of the engine was gradually brought on the road. Originally wrought iron wheel centres were used in these engines, the process of building up of which was a notable piece of smith's work. Cast steel centres, however, were substituted when new wheels were required, at much reduced cost. Each cylinder with its valve chest was cast in one piece, flat slide valves being employed, driven by standard curved link motion. Spiral springs were fitted under the driving wheels. These springs are particularly adapted for use under driving wheels, the fact that they have no internal friction enabling them to respond to inequalities of the road quicker than plate springs, and thus keep the load on the driving axle much more constant—an important point with single-wheelers where adhesion weight is so strictly limited. Lever-reversing gear was provided to all engines of this type, with the exception of the enlarged 1003 batch turned out in 1894, which all had screw-reversing gear. The boilers were remarkable for the absence of a steam dome, the steam being collected from a perforated pipe running the whole length of the boiler, the regulator valve of the slide type being placed in the smoke-box and operated by the well-known "pull-out" handle on the footplate. The fire-boxes were

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Photo] [*G. A. Benn.*

GREAT NORTHERN RAILWAY.

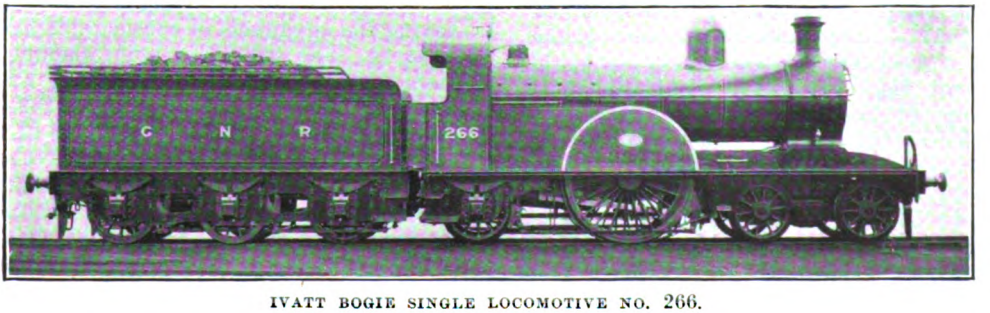
Single locomotive passing Wood Green with a heavy train.

directly stayed to the outer shell, and no provision was made at the front end for the expansion of the tube-plate, a point that was somewhat criticised, though Mr. Stirling affirmed that no trouble from tube leakage was experienced. In the later engines, however, provision was made for expansion on the three front rows of crown stays. A Ramsbottom safety valve was provided over the fire-box, though not mounted on a manhole cover, as is usual, the manhole being placed in the bottom of the boiler barrel. The handsome and graceful brass casing of the safety valve was a noticeable feature of the design. Several of these engines were rebuilt by Mr. Stirling's successor, Mr. Ivatt, with domed boilers. Injectors were fitted, non-lifting, on the sides of the fire-box casing under the frames, the feed check and steam valves being neatly arranged in one casting on the foot-plate. The driving journals were 8½ in. by 8 in., the crank-pins 5 in. by 4½ in. in the 18 in. cylinder engines, the diameter of the driving and crank-pin journals being increased to 9 in. and 5 in. in later engines with 19½ in. cylinders. The boiler pressure in the earlier engines was 160 lbs., and in the 1003 lot 170 lbs. Large six-wheeled tenders carrying 5 tons of coal and 3,500 gallons of water were provided, their weight full being 40 tons 5 cwt.

Many remarkable performances to the credit of these engines are available, and would provide material for a lengthy article, but the writer must content himself with recording the following two, which speak for themselves. In 1895 one of the original 18-inch cylinder engines, with 148 tons, ran from Grantham to Retford (33¼ miles) start to stop in 32 min. 40 sec., averaging 61 miles per hour; and in 1896 one of the 19½-inch cylinder engines, with 186 tons, ran from Grantham to York (82¾ miles) in 80 min. 31 sec.: 61·2 miles per hour. These runs were both recorded by the late Mr. C. Rous-Marten. Their coal consumption was always light, even in the 1888 "Race to the North," averaging only 22·6 lbs. per mile when hauling 140 tons; and the boilers steamed admirably with 4¾ in. blast pipes.

Only a few of the later lot are now at work. One of these engines, No. 664, took part in the memorable procession past the birthplace of George Stephenson at Wylam at the Stephenson Centenary of 1881.

The cost of these, for their period, large engines, was rather high, so Mr. Stirling designed and constructed a six-wheel type of single which proved so efficient that a number were turned out about 1888, though they cannot be said to have superseded the bogie engines. They have the 2–2–2 wheel arrangement, and were constructed to take boilers of virtually identical dimensions to those supplied to the eight-footers. In this design, however, the inside cylinder plan was reverted to, and consequently the



IVATT BOGIE SINGLE LOCOMOTIVE NO. 266.

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DIMENSIONS OF SINGLE-WHEELERS.

Railway.	Type No.	Wheel Type.	Cylinders.		Diameter of Wheels.			Adhesion Weight.	Boilers.			Weight of Engine in W'k'g. Or.	Weight of Tender in W'k'g. Or.	Tractive Force	Date of 1st Building.
			Dia.	Str'ke.	Lead'g.	Driving.	Trail'g.		Wkg. Press.	Total Heat'g. Surface.	Grate Area.				
			IN.	IN.	FT. IN.	FT. IN.	FT. IN.	TONS. CWT.	LBS.	SQ. FT.	SQ. FT.	TONS. CWT.	TONS. CWT.		
Great Northern	773	4–2–2	18	28	3 11½	8 1½	4 7½	17 0	160	1045	17·75	45 3	40 5	94·5	1885
	240	2–2–2	18½	26	4 1½	7 7½	4 1½	17 8	160	1110	18·40	39 14	38 10	97·2	1888
	1003	4–2–2	19½	28	3 11½	8 1½	4 7½	18 0	170	1031·7	20·00	48 15	41 14	110·9	1894
	266	,,	18	26	3 7½	7 7½	4 1½	18 0	170	1269·6	23·2	47 10	40 18	92	1901
Great Western ..	3001	,,	19	24	4 0	7 8	4 6	18 0	160	1561	20·8	49 0	32 10	94·1	1891
Midland ..	600	,,	18	26	3 6	7 4½	4 2½	17 10	160	1240·6	19·68	43 13	36 1	95·7	1887
	608	,,	18½	26	3 6	7 6½	4 4	17 10	160	1223	19·68	43 13	37 0	93·2	1889
	685	,,	19½	26	3 10	7 9½	4 4½	18 10	180	1217	24·5	50 3	49 2	100·4	1900
North Eastern ..	1517	,,	19	24	3 7½	7 7½	4 7½	17 15	175	1139	20·7	46 13	40 1	93·7	1889
Great Central ..	967	,,	19½	26	3 6	7 9	4 6	18 7	200	1194	24·8	47 5	42 5	100·9	1900

driving wheel diameter was reduced to 7 ft. 7½ in. in conjunction with 18½ in. by 26 in. cylinders, which gave a tractive force of 97·2 lbs. per lb. of mean effective cylinder pressure. The leading and trailing wheels were 4 ft. 1½ in. diameter, and had outside bearings, the driving wheels having inside bearings only. In order to facilitate the passage of the engines round curves, the leading axle-boxes were given a certain amount of play in the horns, and the axle could further move laterally in the brasses, the journals being turned concavely to return them quickly on the engine regaining the straight. The crank-axles were of Siemens-Marten steel, and had journals 8¼ in. by 7 in., and wheel seats 9¾ in. diameter. Slide valves operated by curved link motion reversed by a lever were employed. Steam sanding gear was fitted.

These engines were, as would be expected, considerably lighter than the 4–2–2's, but they were able to do quite as well as the heavier engines, and the coal consumption working the same trains was practically identical in both types. As regards speed, they are reputed to have surpassed the 8 ft. 1 in. engines, and during the 1888 and 1895 races many fine performances were placed to their credit, amongst which may be mentioned No. 233's achievement in August, 1888, when she ran from King's Cross to Grantham, 105¼ miles in 105 min., an average speed of 60·2 miles per hour. Several of them have been rebuilt by Mr. Ivatt with domed boilers, pull-out regulators, however, being retained. When the special Sheffield and Leeds "flyers" were put on a few years back, these old engines did particularly smart work, as was recorded in these pages at the time. They are now mostly employed on slow and semi-fast stopping trains or on longer branch services.

The last single-wheelers to be built for the Great Northern Railway were turned out from the designs of Mr. H. A. Ivatt as recently as 1900, and are of the 4–2–2 design. Singularly handsome-looking machines and having the advantage of considerable boiler capacity, they still do a large amount of main line express work. The driving wheel diameter was kept the same as in the 2–2–2's described above. Inside cylinders 18 in. by 26 in., having slide valves placed above and driven by link motion gear through rocking shafts, were adopted, with inside bearings for the driving wheels. The leading ends of these engines are carried on standard Great Northern swing-link bogies, having two

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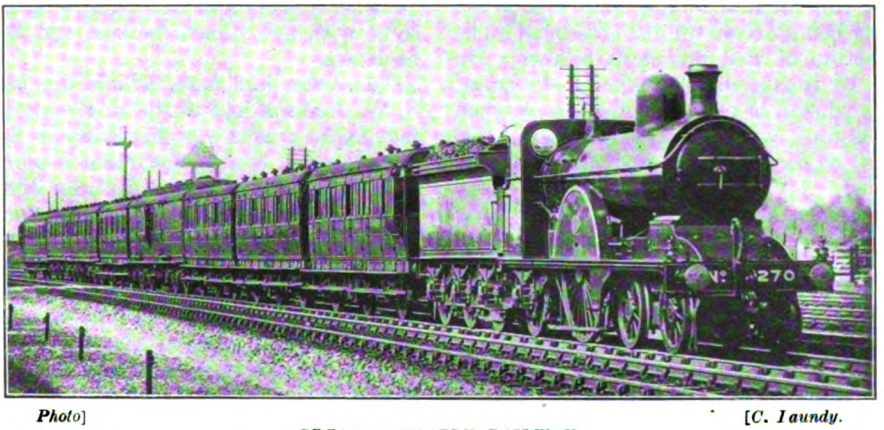
spiral springs to each axle-box, and wheels 3 ft. 7½ in. diameter. The frames are provided with outside bearings for the trailing wheels, which are 4 ft. 1½ in. diameter. The boilers have domes, Ramsbottom safety valves, and the regulators are of the usual slide pattern. Spiral springs are provided under the driving wheels, and steam-sanding gear is fitted. Readers who turn to page 124, Vol. XXVII. of the RAILWAY MAGAZINE will find an interesting tabular statement of a series of runs made by the 266 class between Grantham and York, from the observations of Mr. C. J. Allen, which shows most clearly the capabilities of these fine machines.

The Great Western Railway, with its easy main line from London to Bristol, was from its opening and for many years a single-wheeler preserve, and few railways in the country have constructed more locomotives of both the 2–2–2 and 4–2–2 designs. To give an account of all these various engines would involve the preparation of a small volume, and therefore the writer proposes to limit himself to a description of the most numerous of the Great Western single-wheelers, viz., the 3001 or "Amazon" class. The first set of these handsome locomotives originally ran on the broad gauge, and were constructed by the late Mr. William Dean as six-wheeled machines. They were built as narrow gauge engines in all but the length of their axles, and were designed to be readily convertible to the narrow gauge on the abolition of the broad in 1892. To effect this, double sandwich frames were provided with double bearings, but the wheels, instead of being between the double frames, were outside both frames. No splashers were fitted, with the exception of a very small protecting frame, the running plate following the contour of the wheels. On the conversion of the gauge these engines returned to Swindon, were lifted, the broad gauge wheels and axles run out and new ones to the 4 ft. 8½ in. gauge run under; they were then lowered, springs coupled up again, and a series of fine narrow gauge singles resulted. Experience proved that the great concentration of weight on one axle at the forward end was objectionable and did not make for smooth running, and, consequently, in 1894 the whole of them were rebuilt with bogies, realising a vast improvement in their appearance. At the same time the diameter of the cylinders, originally 20 in., was reduced to 19 in., with beneficial results. So efficient were these engines in working expresses between London, Swindon, and Newton Abbot that 80 in all were built. The boilers were lap-jointed, consisting of two rings, 4 ft. 3 in. diameter, at the rear and 4 ft. 2⅛ in. diameter at the front end, their centre line being 7 ft. 7⅛ in. from rail level. A dome was located on the second ring, and safety valves over the fire-box casing. The fire-boxes had raised tops of round form to give increased steam space, the inner fire-box crown stays being arranged in groups screwed into small castings suspended by slings to brackets rivetted to the outer shell. The working pressure was 160 lbs. per sq. in. The suspension of the forward end on the bogies was somewhat unusual, four pillars rivetted to the main frames transmitting the weight to a cross frame which



Photo] [*C. Iaundy.*

GREAT NORTHERN RAILWAY.

Boston-Peterborough train drawn by Ivatt single No. 270.

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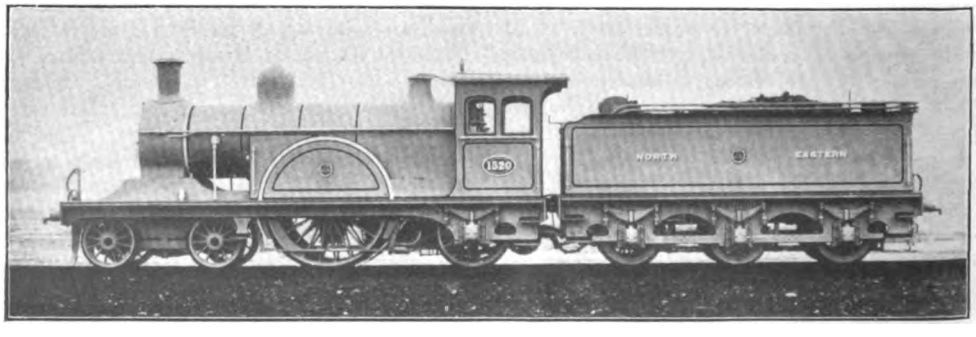
ran under the bogie frame. The connection between bogie and engine was through horizontal swing links, and a centre pin inserted from below and having side traverse controlled by springs. The bogies had outside frames and bearings. Double frames and bearings were provided for driving and trailing wheels and plate springs for all axle bearings, with the exception of the inside bearings of the trailing wheels, where restricted space necessitated coil springs. The cylinders were inside, inclined 1 in 33, the valve chests being below, the steam ports 1 ft. 2 in. by 2 in., and exhaust 1 ft. 2 in. by 3¼ in. Slide valves driven by curved link motion, reversed by screw gear, distributed the steam supply. Double slide bars, with connecting rods having forked small ends with wedge and cotter adjustment were employed, a small vacuum pump for maintaining the vacuum in the train pipe when running being driven off one crosshead. The distribution of weight was as follows: On bogie, 18 tons; driving wheels, 18 tons; trailing wheels, 13 tons. The tenders weighed some 32 tons, with 4 tons of coal and 3,000 gallons of water, pick-up scoops being provided.

A Pertinent Paragraph in a recent issue of the RAILWAY MAGAZINE refers to these engines as "the *beau-ideal* of a popular type of locomotive" and they certainly merited the description, as considerable pains were taken to impart a smart and attractive finish. The large polished brass dome and safety valve covers, the copper chimney caps, the brass beading of the splashers and cabs, brass name lettering and numbering, and the highly finished painting and lining produced a strikingly handsome locomotive.

Their reputation for speed was undeniably good, and a very fair share of record performances fell to them. Of these the notable achievement of 3065 *Duke of Connaught*, on May 9th, 1904, when, with 120 tons, the distance from Bristol to Paddington (118⅜ miles) was covered in 99¼ min., stands easily first. The article entitled "Some Great Western Expresses," by the late Mr. C. Rous-Marten, on page 209, Volume II. of the RAILWAY MAGAZINE, gives an account of their performances in every-day working, when they were doing the fastest express work on the Great Western Railway; and as recently as Vol. XXIX., page 296, fresh evidence of their efficiency was published. In coal consumption they were very light, burning only from 31 to 33 lbs. per train mile, with loads averaging 200 tons. Several of them were rebuilt with domeless boilers and Belpaire fireboxes, and some with new domed boilers, and Belpaire fireboxes.

The abundant faith which the late Mr. S. W. Johnson had in the single-wheeler for fast express work on the Midland Railway is evidenced by the fact that he built no fewer than 95 of them between 1887 and 1900. These engines were all of the 4–2–2 type, had inside cylinders and double bearings to the driving wheels. The diameter of the driving wheels increased, in successive series, from 7 ft. 4½ in. to 7 ft. 9½ in., while the cylinder dimensions varied from 18 in. to 19½ in., the stroke always being 26 in. Similarly, in the earlier engines the boiler centres were pitched 7 ft. 5 in. from rail level, and this dimension was gradually increased to 8 ft. 1 in. in the final set produced in 1900, one of which, No. 2601 (now 685), *Princess of Wales*, was the object of



NORTH EASTERN RAILWAY "SINGLE-DRIVER" (7 ft. 7 in. class).

Converted from two-cylinder compound.

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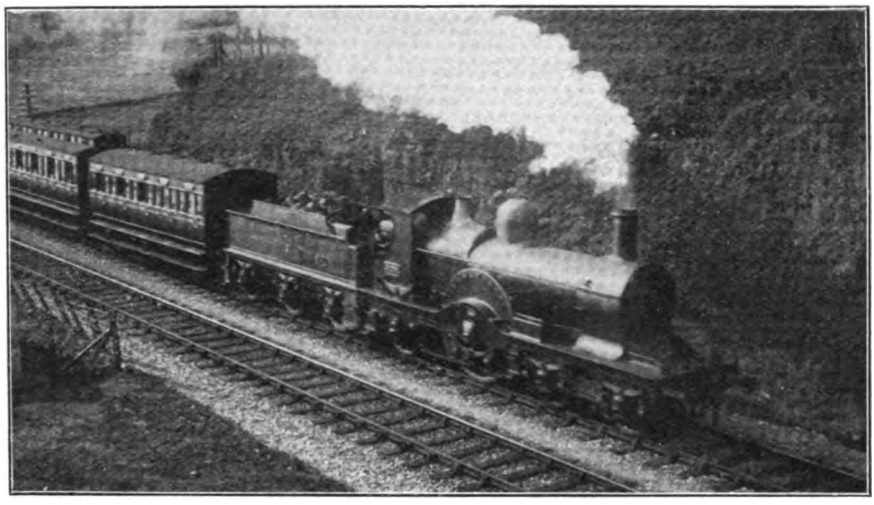

Photo] [*H. K. Luce.*

GREAT WESTERN RAILWAY.

8.45 a.m. express from Plymouth to the North, taken by single engine No. 3078 *Eupatoria.*

much admiration at the Paris Exhibition in that year.

These single-wheelers incorporated several interesting details of design, perhaps the most important of which was the adoption of piston valves. They were the first class of locomotive in this country to be fitted extensively with these valves; the original series so equipped being turned out from Derby in 1896. The results were so favourable in decreased valve friction, with consequent economy in fuel and repairs, that the Midland Railway have to-day some 250 locomotives fitted with such valves. In the Midland "singles" the cylinders and valve chest were cast together, the valves working below the cylinders and inclined upwards at a sharp angle to enable the link motion to drive direct without the intervention of rocking shafts. The piston valves used were of the patented designs of Mr. W. M. Smith, and careful provision was made for the escape of water from the cylinders should the boiler prime. This was effected as follows: The heads of the valves had a special form of packing ring which, when steam was on, was kept up to the face of the piston valve liner by steam pressure. When steam was shut off, however, the ring, which was made in collapsible segments, could be forced inwards by trapped water allowing its escape into the steam chests. In 1897, Mr. S. W. Johnson made an interesting communication to the Institution of Mechanical Engineers in which he stated that a careful record had been kept of the amount of metal worn off the piston valves and rings in a number of single-wheelers working between Bristol and Derby, and compared with the wear of flat slide valves in similar engines on the same route, the result being that piston valves showed only one-sixth the amount of wear of slide valves.

It has been asserted that with single-wheelers, in addition to the often excessive slipping at starting which takes place, a considerable loss of power results from a small continual slip going on. To test this one of the Midland "singles" was hauled by another engine over a certain length of line, a careful record of the revolutions of the driving wheels of the "single" in covering this distance being taken, and the engine was then attached to a London and Nottingham express and the number of revolutions of the driving wheels in covering this 123½ miles carefully recorded. This experiment revealed practically no slip at all; on the other hand, the late Mr. C. Rous-Marten recorded in these columns some years ago that an identical experiment revealed that a new 7 ft. 6 in. single lost about 4 per cent. of her power through the small continuous slipping of her driving wheels.

Metallic packing for piston and valve rods was fitted to these engines. The boilers were telescopic, had domes, and two safety-valves were provided, one a Salter spring balance valve on the dome, and the other

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of the lock-up type over the fire-box. The inner fire-box was stayed to the outer shell by crown stays and roof girders, each girder being built up of two steel plates rivetted together through distance ferrules and hung by links to the customary angles rivetted to the outer shell. As will be seen from the dimensions in the accompanying table the total heating surface was reduced in successive lots from 1,240·6 sq. ft. to 1,217 sq. ft. in the earliest and latest built engines, although the grate area was increased. The blast pipe diameter was 5 in. Screw reversing gear was provided, and all the engines had steam sanding gear. Plate springs were fitted under the driving wheels in the earlier engines, but in the later ones spiral springs were substituted.

his office as locomotive superintendent of that railway, as two-cylinder compound engines on the Worsdell-Von-Borries system, and then had high pressure cylinders 20 in. diameter, and low pressure 28 in. diameter, both placed between the frames and having a common stroke of 24 in. Owing to the great diameter of the low pressure cylinder it was necessary in order to get them between the frames, to place the centre lines on different planes, and to incline the low pressure cylinder upwards and the high pressure downwards from the crank-axle centre line. The valve chests were cast on the outsides of the cylinders and projected through openings in the framing. Flat slide valves were used, driven by Joy's valve gear through specially arranged rocking

Photo] [*H. T. Worlock.*

MIDLAND RAILWAY.

Milk train drawn by "single" locomotive No. 658.

As regards speed these locomotives were veritable "greyhounds," and one of them, No. 117 (now 672), was authentically timed on one occasion to cover 1¼ miles in 50 sec. —90 miles per hour. Those readers desirous of information as to performances of these splendid machines should most certainly refer to the issues of the RAILWAY MAGAZINE, January to March, 1910, inclusive, in which appeared a series of articles describing the engines and their performances from the pen of Mr. J. F. Vickery.

The most noted type of single-wheeler employed on the North Eastern Railway, is the 1517 class. They were originally built by Mr. T. W. Worsdell, during the term of

shafts, the valve travels being, for the H.P. cylinder 4⅜ in., for the L.P. 5¾ in., the difference being to give a later cut-off in the L.P. cylinder for a given cut-off in the H.P., the valve gears not being arranged for independent adjustment. The driving wheels were 7 ft. 7¼ in. diameter, and inside bearings only were provided, volute springs being placed under the driving wheels, and plate springs under the trailing wheels, which were 4 ft. 1¼ in. diameter, the bogie being of the equalised cradle-suspension type with two plate springs. In the smoke-box a large receiver pipe was placed between the high pressure and low pressure steam chests and in this pipe was arranged an

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intercepting or starting valve, by means of which, when operated from the cab, high pressure steam could be admitted direct from the boiler to the low pressure cylinder, should the engine stop with the high pressure crank on a dead centre. This valve was so designed that immediately the controlling handle in the cab was released the engine would automatically commence to work as a compound. The boilers presented no particular points of interest; they were butt-jointed, 4 ft. 3 in. diameter outside, having domes and Ramsbottom safety valves situated over the fire-box, the inner fire-box being stayed by cast steel girders hung from angles rivetted to the outer shell. The working pressure was 175 lbs.

As compounds these engines did very good work. In one case, when hauling 310 tons (including the weight of engine and tender), a maximum speed of 86 miles per hour was recorded on the level, at which a total of 1,068·6 horse-power was indicated with mean effective pressures of 45·68 lbs. per sq. in., in the H.P. cylinder and 21·92 lbs. in the L.P. The fuel consumption was very moderate, averaging only about 33 lbs. per train mile working the Scotch expresses. These engines had, at the time they appeared, the distinction of being the heaviest at work in the Kingdom, the total weight of engine and tender in working order being 86 tons 14 cwt., 17 tons 15 cwt. being on the driving wheels, to which the steam sand blast was applied.

Successful as they appear to have been as compounds, upon Mr. Wilson Worsdell succeeding his brother as locomotive superintendent, they were converted to simple engines, the compound cylinders being replaced by a pair 19 in. diameter by 24 in. stroke, curved link motion reversed by a screw being substituted for the Joy gear. As rebuilt they did some particularly smart work as the two following instances will show; in 1896 one of them left York 2 min. late with 134 tons behind the tender and covered the 80½ miles to Newcastle in 79¾ min., arriving 10 min. early; No. 1522 in 1895, with 140 tons ran from York start to Darlington pass in 42¾ min.

In the autumn of 1896 a series of trials were conducted on the North Eastern Railway between Newcastle and Tweedmouth, with five different standard North Eastern locomotives, the results being embodied in a paper read before the Institution of Mechanical Engineers by the late Mr. Walter M. Smith. One of these single-wheelers was included, the engine selected having piston valves situated above the cylinders at an angle and driven direct by link motion. The results of the test are given in the following summary:—

TEST OF 4-2-2 (1517) CLASS NORTH EASTERN RAILWAY BETWEEN NEWCASTLE AND TWEEDMOUTH.

Time for double journey.. ..	2 h. 30 m. 6 sec.
Total weight of train of 15 vehicles	186·5 tons
Boiler steam pressure in lbs. per sq. in.	175 lbs.
Coal burned per sq. ft. of grate per hour	109·6 ,,
Water used per lb. of coal from and at 212 deg. Fah. ..	9·73 ,,
Coal burned per I.H.P. per hour	3·11 ,,
Steam consumption per I.H.P. per hour	30·26 ,,
Average I.H.P. for double journey	729·2 ,,

A maximum indicated horse-power of 826 was developed by the single-wheeler during the above test, and in his paper, Mr. W. M. Smith considered that the engine had well maintained her position against nominally more powerful coupled engines with which she competed.

As far as the writer is aware the whole of these engines are still running, and for some time they have done very good work on the Leeds and Scarboro' services.

The Great Central Railway possesses some long stretches of relatively easily graded track, notably between Retford and Grimsby, Sheffield and London, and on the Cheshire Lines section between Manchester and Liverpool. The only single-wheelers now to be found on their metals, however, are the handsome 967 class, constructed by Mr. Harry Pollitt, then locomotive superintendent, just after the opening of the London extension. They are very similar in design to the 266 class of the Great Northern Railway, but have cylinders 1½ in. larger and piston valves of the Smith type, the valve chests being placed below the cylinders, and curved link motion gear being provided. The driving wheels are 7 ft. 9 in. diameter, having inside bearings, spiral springs being placed under the driving axle-boxes, and plate springs under the trailing. The bogies are of compensated cradle type with two plate springs, and the pin had 1¾ in. side play each side of the centre. The boilers originally provided had butt-jointed barrels 4 ft. 3 in. outside diameter and Belpaire fire-boxes, the heating surfaces being:—Tubes, 1,062 sq. ft., and firebox, 132 sq. ft. with 24·8 sq. ft. grate area, the centre line being 8 ft. 2 in. from rail level. One of these engines has recently been re-built with a

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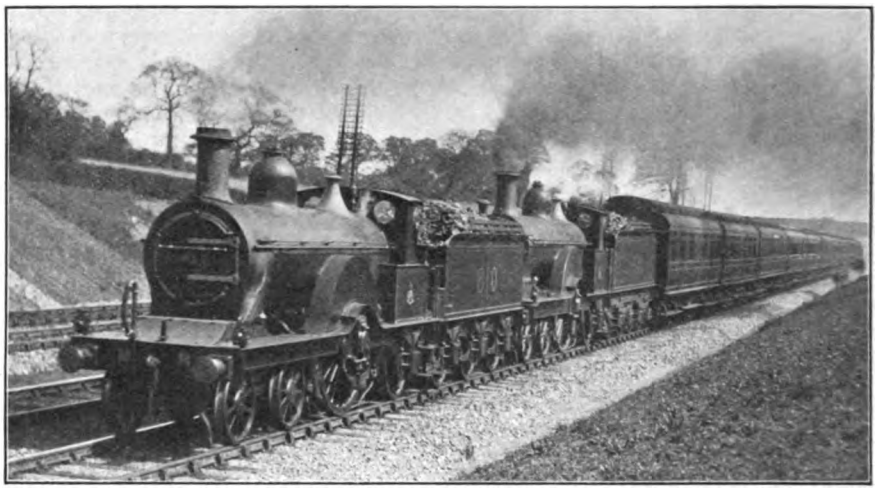

Photo] [*F. E. Mackay.*

MIDLAND RAILWAY.

2.5 p.m. down Leeds and Bradford express drawn by two "singles," Nos. 610 and 686.

much larger standard Great Central boiler and was illustrated on page 250 of Vol. XXX. of the RAILWAY MAGAZINE; a new pattern cab has also been provided.

These locomotives did a good deal of passenger work originally on the London section, and doubtless could, had the timetables of those days demanded it, have attained high speeds. They are all now working principally on the Cheshire Lines section, where they do remarkably well, often cutting the time down considerably below the 40 min. allowed between Liverpool and Manchester.

In conclusion, it may be remarked that the single-wheeler has always been essentially an English locomotive type, nowhere outside the British Isles has it flourished to any great extent, limited adhesion preventing its adoption in most foreign countries where the permissible axle-load is much below that allowed by English permanent way, hence the employment of coupled engines has been a matter of necessity. There are still many enthusiasts who would like to see the type perpetuated, but it must be remembered that the weak point of the single-wheeler must always be lack of adhesion, and no matter how big the boiler or how great its steaming capacity, unless the potential energy in the steam can be absorbed by the adhesion weight on the driving wheels, no increment of tractive effort is possible. The weight upon the driving axle cannot be increased owing to the limitations of the permanent way and therefore, it is unquestionable that with modern train loads and schedules the day of the single-wheeler is past.

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THE CENTRAL STATION, COURT SQUARE, CARLISLE.
(*From the "Illustrated London News"*).

The Lancaster and Carlisle Railway.

(II. and Concluding).

By HERBERT RAKE.

ON referring to the gradient profile of the line, it will be noticed that the Grayrigg bank begins about 2 miles before reaching Oxenholme, and continues in an unbroken ascent all the way to Grayrigg—26 miles 10 chains from Lancaster and 7 miles 3 chains from Oxenholme. After leaving Oxenholme, the line proceeds over heavy embankments and through deep cuttings, the most formidable of which is Birkland cutting, about 4 miles from Oxenholme, from which 150,000 cubic yards of earthwork was excavated. The line then skirts Benson Knot, and shortly afterwards reaches Dockers Garth or Fiddlers Gill viaduct, one of the most beautiful structures on the line, consisting of six arches each of 50 ft. span, the middle piers being about 50 ft. high and the width between the parapets 25 ft. Its total length is 370 ft. Not far from Dockers Garth viaduct Grayrigg summit, 26 miles from Lancaster, is reached. At this point the line is 600 ft. above the Ordnance Datum, having risen continuously from below Oxenholme in gradients varying from 1 in 106 to 1 in 182 with a short stretch of 1 in 859. The line here passes through a heavy cutting of samel (a kind of brick clay).

Next comes Low Gill viaduct and Junction. The former contains about 170,000 cubic yards of earthwork and is 95 ft. above the bed of the ravine. Low Gill station is the junction for the Ingleton Branch, 18 miles 58 chains long. This line originally formed part of the Clapham and Ingleton branch of the "Little North Western Railway" before mentioned, but the promoters of the line, having fallen into difficulties, the northern part of the works were abandoned, after being partially constructed, in which state they remained for several years, when a fresh application was made to Parliament for powers to complete the line. The Lancaster and Carlisle Company also sought like powers, and being financially the stronger body, obtained their Act on August 25, 1857, completing the railway at enormous cost. Passing through a picturesque country, the line, constructed with a double track, was opened in September, 1861. Local traffic, of which there was very little, has since remained stationary, but as a part of a through route the line played an important part from 1861 to 1876, as between these dates the whole of the Midland Scotch traffic passed over the rails. As may be supposed, the Lancaster and Carlisle Company and their successors in office did not put themselves out of the way to expedite the movements of

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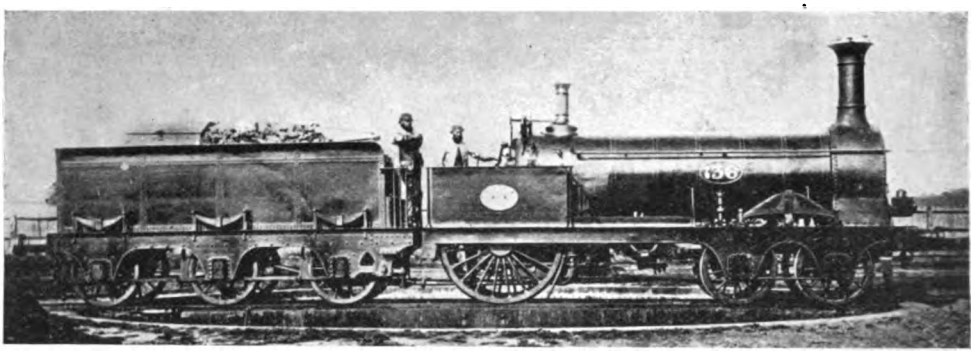

OLD CRAMPTON ENGINE BUILT FOR THE LANCASTER AND CARLISLE RAILWAY IN 1851 BY MESSRS. ROBERT STEPHENSON AND COMPANY.

travellers between the Midland system and Scotland. The Midland Chairman once said "It is a very rare thing for me to go down to Carlisle without being turned out twice. I have seen 12 or 15 passengers turned out at Ingleton and the same number at Tebay." The result of all this was the construction of the Settle and Carlisle line, which was opened for passengers on May 1, 1876, from which date the Ingleton branch lapsed into the position of a local country line and as such has since remained.*

After leaving Low Gill the main line follows the valley of the Lune and, skirting the Dillicar Hills, enters the Dillicar cutting, from which nearly 70,000 cubic yards of solid blue rock was excavated. It then crosses the Borrow Water near its junction with the Lune, upon a viaduct 68 ft. high, consisting of three arches each of 45 ft. span. Passing the village of Borrowbridge on the right, the line traverses Borrowbridge cut, which was excavated through hard blue rock. Next the Lune embankment is crossed. This contains about 75,000 cubic yards of earthwork and rests upon the old bed of the river, which at this point was diverted from its course. Tebay, 32 miles 13 chains from Lancaster, is the next station. When first opened, it was of very little importance, being merely a roadside station. When, however, the Stockton and Darlington Railway (now the North Eastern Railway) from Barnard Castle was opened in August, 1861, Tebay became a junction of some consequence as a point of exchange for coal trains from the Durham pits to Barrow and for hæmatite ore trains from the Furness district to the Cleveland blast furnaces. When the line was completed the Lancaster and Carlisle Company erected an engine shed for the reception "of the assistant engines" up Shap bank and also "cottages for the workmen." The station is now joint between the London and North Western and North Eastern Companies.

The Birk Beck embankment and viaduct are next crossed, the latter being 45 ft. high, with arches similar to those of the Borrow viaduct. Leaving the Birk Beck, the line enters a cutting, the hardest and most expensive in the whole length of line, and varying in depth from 50 to 60 ft. Here the most difficult section of the whole line, for trains, is encountered, namely, Shap bank, which ascends at a gradient of 1 in 75 for nearly 5 miles to Shap summit, 916 ft. above Ordnance Datum. It was said when the line was projected that if the incline were ever formed, it would render the railway useless, as it was considered "an engineering impracticability." Yet to-day some of the heaviest and fastest timed trains in the kingdom traverse it! An assistant engine was, from the opening of the line, kept at the foot of the incline to assist north-bound trains. The only works before the summit is reached are the Crosby Ravensworth cutting and Shap Wells embankment. Shap Wells village, which used to be of some note as a watering place, is situate about a mile to the south of the summit. On arriving at the summit—a distance of 5 miles 42 chains from Tebay and 37 miles 55 chains from Lancaster—the line traverses a hard rock cutting 60 ft. high. This was one of the most difficult pieces of work on the line, 500 navvies being employed on it for many months. As there was no village of any sort in the vicinity when the line was being

*Note.—During the summer of 1911 an express left Leeds (Wellington Station), at 10 a.m., arriving at Penrith at 12 noon, and Carlisle at 12.25; and an up Express left Carlisle at 1.10 p.m., and Penrith at 1.42 for Leeds and St. Pancras. Both these trains travelled *via* Ingleton and Tebay.

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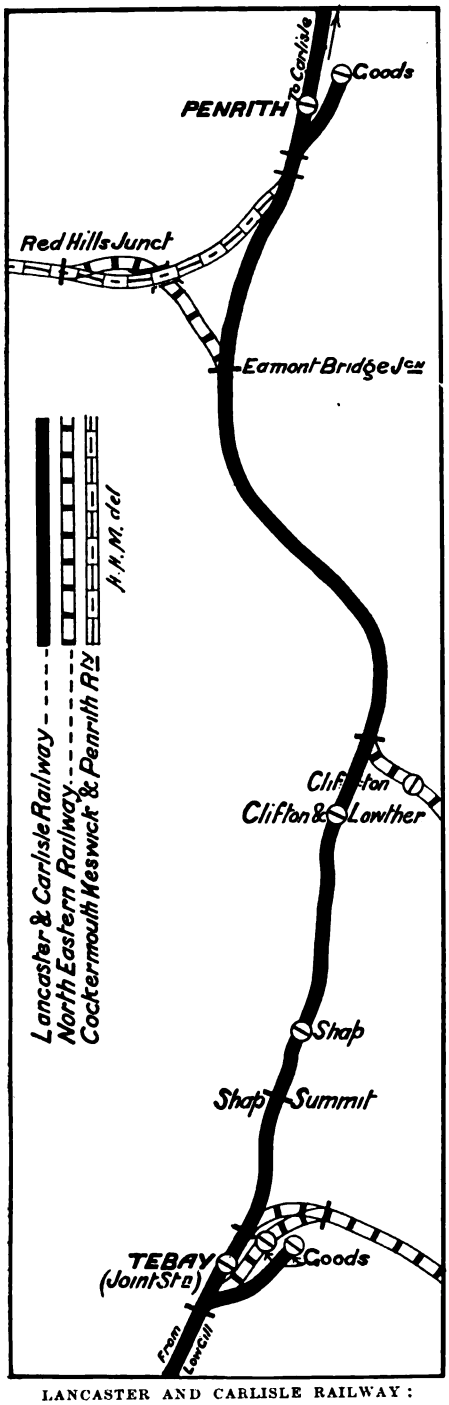
constructed, a number of huts were erected for the use of the men during operations. Even now there are only a few cottages for the Company's employés. It has been stated



LANCASTER AND CARLISLE RAILWAY: TEBAY AND PENRITH SECTION.

that the course of the line over Shap Fells is almost the same as that followed by "Bonnie Prince Charlie" and his army in the "forty-five."

From Shap summit the line falls the whole way to Carlisle, 31 miles distant and 75 ft. above sea level, the principal gradients varying between 1 in 125, 1 in 132, 1 in 169 and 1 in 184. After leaving the summit the railway passes through cuttings of limestone rock past Shap village, which lies to the west; then along a short level stretch past Shap mines towards Clifton, passing Thrimby Hall on the west. Here the character of the scenery begins to alter, fertile pastures taking the place of bare sterile hills. After passing on the east of Lowther Castle, the seat of the Earl of Lonsdale, the Lowther embankment is crossed, and shortly afterwards Clifton and Lowther, originally called "Clifton Moor," is reached, while 77 chains further on is Clifton or Eden Valley Junction, where a connection is made with the North Eastern Railway. This junction was opened in 1861 when the Eden Valley section of the Stockton and Darlington Railway was constructed. Next comes the Lowther viaduct, about 20 miles distant from Carlisle. This structure is about 100 ft. above the level of the stream, and consists of six semi-circular arches, each of 60 ft. span, supported on piers 8 ft. thick at the top, increasing to 13 ft. 6 in. at the base. The viaduct has a total length of 500 ft. Two miles 13 chains from Eden Valley or Clifton Junction is Eamont Bridge Junction. From this point the North Eastern Railway constructed in 1866 a loop 1 mile 3 chains long, connecting with the Cockermouth, Keswick, and Penrith Railway at Red Hills Junction, and known as the "Red Hills Loop." Close by, the Eamont is crossed by a handsome viaduct consisting of five semi-circular arches of 50 ft. span. It is 70 ft. high and upwards of 300 ft. long. When crossing the Eamont the line enters Cumberland.

The Cockermouth, Keswick and Penrith Railway, opened in November, 1864, joins the Lancaster and Carlisle Railway 57 chains north of Eamont Bridge Junction and 28 chains south of Penrith station, closely adjoining which are the ruins of Penrith Castle. Beyond Penrith the line enters the valley of the Petteril river, which it follows in a fairly direct course to Carlisle, passing on its way Plumpton, Calthwaite, Southwaite, and Wreay. Near the last-mentioned place the line traverses a high embankment and then runs under Newbiggin Bridge, built for the convenience of the proprietor of

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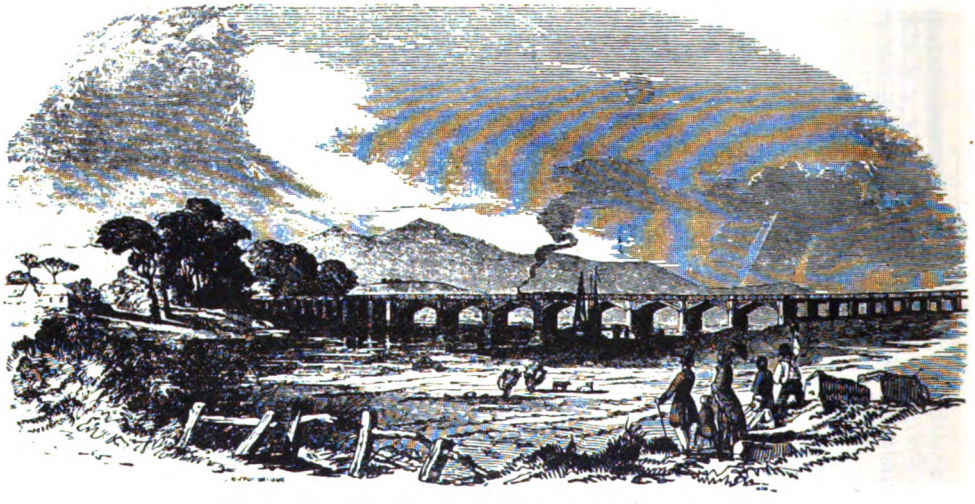
Newbiggin Hall. After passing Upperby Junction the line ends in "Merrie Carlisle." The contractors who, duringthe progress of the works had in their employment 9,615 men and 99 horses, pushed on the construction of the works with such expedition that the line was opened for passenger traffic as far as Oxenholme Junction on September 22, 1846, and to Carlisle on December 17 following. On December 11 a trial trip was made from Carlisle to Lancaster by the directors and various officials connected with the construction of the line. Consisting of an engine and three carriages, the train proceeded at the rate of upwards of 30 miles per hour, and would have reached Penrith in 35 min. but for a slight accident, when about 2 miles from that place causing a delay of about an hour. The train reached Lancaster after about 3 hours actual travelling, the directors having stopped at several places to inspect the works.



THE ESK VIADUCT, SHOWING SKIDDAW IN THE DISTANCE.
(*From the "Illustrated London News"*).

Next morning Captain Coddington, the Government Inspector, along with the Directors, started on a tour of inspection of the line, the train consisting of an engine and four carriages. The day was very cold, rain, snow, sleet, and frost falling in turn, the result being that the rails presented the appearance of long tracks of ice and being, of course, extremely slippery. The question was how would the ascent of the Shap bank be made and the whole party watched this particular section with great interest. Captain Coddington, riding upon the engine, timed the progress of the train up the bank, and when the summit was reached, stated that, notwithstanding the slippery state of the rails, the ascent had been made at the rate of 20 miles an hour, although the engine was an old one and not one of the most powerful class. All the bridges, viaducts, cuttings and embankments were minutely examined by the Inspector, who on his arrival at the end of the journey expressed himself as highly pleased, and said the public might travel over the whole line with perfect safety. He thereupon gave the Directors the usual Government Certificate. The line was ready for opening to the public, and accordingly Tuesday, December 15, 1846, was fixed for the formal inauguration. On the morning of that day the Castle station, Lancaster, was a scene of unusual bustle and excitement, and after the necessary arrangements had been completed, the Directors' train, consisting of six first-class and three second-class carriages, started on its journey to Carlisle. Arriving at Penrith, it was met by another train from Carlisle, and after a short interval both trains proceeded towards Carlisle, which was reached between 4 and 5 o'clock. In the evening the Directors and their friends were entertained at a banquet, "the confectionery and most of the table ornaments having been forwarded from Liverpool."

On October 2, 1846, a meeting of the representatives of the Lancaster and Carlisle, Caledonian, Maryport and Carlisle and

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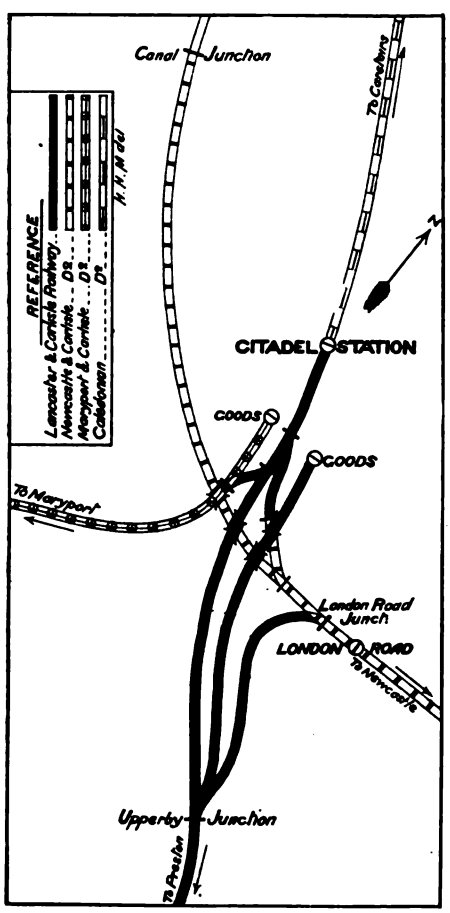
Newcastle and Carlisle Railways, was held to consider the question of a joint station in Carlisle, the land on which the structure was to be built being in the possession of the Lancaster and Carlisle Company. Plans were submitted and approved, subject to certain provisions, and the contract for a general joint station was let to Messrs. Brassey & Stephenson, it being understood that each of the four companies should contribute to the cost in such proportions as might be agreed upon. However, the Maryport and Carlisle and the Newcastle and Carlisle Companies signified their desire to withdraw from the arrangement as to the contribution towards cost. Consequently the station became the property of the Lancaster and Carlisle and Caledonian Companies, and was erected at a cost of £155,689, of which sum the Caledonian contributed £51,367. Subsequently the two smaller companies were admitted as tenants



RAILWAYS AT CARLISLE, AFTER THE OPENING OF THE CALEDONIAN RAILWAY.

to those portions of the station originally set aside for their accommodation. At the time of opening of the Caledonian Railway in September, 1847, arrangements for the management of the traffic of all four companies were not completed, but the two owning companies entered into possession as soon as the station was sufficiently advanced to allow of occupation. Until that happened the Lancaster and Carlisle Company found a temporary resting-place in the London Road station of the Newcastle and Carlisle Company by means of a connecting loop from Upperby Junction to London Road. Subsequently the North British, Glasgow and South Western and Midland Railways were also admitted into the station, the last named, running over the Newcastle and Carlisle Company's line for a distance of 39 chains from Petterill Junction, and the Glasgow and South Western over the Caledonian line from Gretna Junction.

The station was designed in the old English style of architecture, and up to the year 1860 consisted of a single through platform, with bays at each end; but it has since been twice enlarged—in 1861 and again in 1880. For a map of the present station readers are referred to Vol. 7, p. 387 of the RAILWAY MAGAZINE. After the various companies other than the owners had obtained admission to the station it was deemed advisable to transfer the regulation of the traffic in and through the station to a joint committee. Accordingly a joint board of the owning companies was formed under the name of the "Citadel Station Joint Committee," and the station, with 18 chains on the north side and 58 chains on the south side of the approach roads, was transferred to their administration. The other companies using the station and approach lines do so merely as tenants, and work their own trains in and out. In 1877 it was found necessary to exclude all goods and mineral trains with the exception of express fish traffic from the station. Besides the Station Joint Committee there is the "Carlisle Goods Traffic Committee," composed by the Caledonian, London and North Western, Glasgow and South Western and Midland Railways, and controlling 1 mile 51 chains of line used for goods traffic between Willow Holme and Caldew Junctions on the north side and the Joint Line Junction with the London and North Western Railway on the south side of the station.

First to run into Carlisle was the Newcastle and Carlisle Railway (now the North Eastern Railway), which was opened in 1836.

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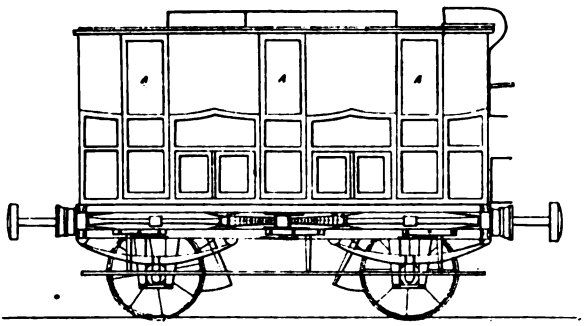
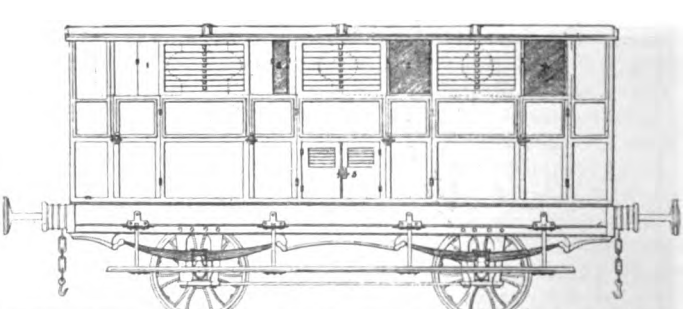


OLD THIRD-CLASS PARLIAMENTARY CARRIAGE FOR 24 PASSENGERS: NORTH UNION RAILWAY.

Previous to gaining admission to the Citadel station, this company had its terminus at London Road, to which point the Lancaster and Carlisle Company formed a connecting loop from Upperby Junction. The Newcastle and Carlisle Company's Canal Branch was formed in 1837, and subsequently connected with the North British Railway. The Lancaster and Carlisle Railway enjoyed a separate existence until August 1, 1859, when the London and North Western acquired a lease of the line for 999 years. Very curious were the terms of the lease, which set forth that the London and North Western Company were to have control of the line, "the plant, rolling stock, and movable property to be used by the lessees during, and to be restored at the end of, the lease." As it happened, however, this stipulation will never have to be enforced, as the Company was amalgamated with the London and North Western Company on July 21, 1879. At the first meeting of shareholders of the Lancaster and Carlisle Company held on June 28, 1844, the design for the official seal of the Company as illustrated last month was approved of and adopted. It consisted of the Arms of Lancaster, Kendal, Penrith, and Carlisle.

As already mentioned, the inhabitants of Kendal and Windermere were disappointed at being left in the lurch by the Lancaster and Carlisle Company. They therefore called a meeting, and appointed a provisional committee to promote a railway from Windermere and Kendal to the Lancaster and Carlisle main line at Oxenholme. A Bill was accordingly deposited in Parliament in November, 1844. It passed through both Houses as an unopposed measure, and received Royal Assent on June 30, 1845. This line was to be 10 miles 20 chains long, and the chief offices of the company were at Kendal. The capital of the company was £175,000, divided into 5,000 shares of £25 each, with borrowing powers to the extent of £56,000. The first portion of the line to be completed was the section between Kendal and Oxenholme, which was opened on September 21, 1846, the same day as the Lancaster and Carlisle Railway to the same place. A special train left Lancaster, consisting of 14 carriages, but as there was not sufficient room for the passengers inside, "the surplus were allowed to ride on the tops." When the train reached Kendal the Lancaster and Carlisle Directors and visitors were entertained in the Town Hall. The "special" returned to Lancaster in the evening, and the public were carried from the next day. The rest of the railway to Windermere was opened on April 21, 1847. A few years after the opening ceremony the Lancaster and Carlisle Company entered into negotiations for a lease or purchase of the line, but the terms were very difficult to arrange, and the whole matter was finally submitted to arbitration, with the result that the control of the line was handed over to the Lancaster and Carlisle Company on May 1, 1857, and was, along with that company as before stated, amalgamated with the London and North Western Company on July 21, 1879.

There are two other short railways branching off from the Lancaster and Carlisle line which it would be as well to refer to,



OLD THIRD-CLASS PARLIAMENTARY CARRIAGE FOR 40 PASSENGERS: LANCASTER AND CARLISLE RAILWAY.

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although they were not constructed till after the acquisition of the latter line by the London and North Western Company. The one is the Glasson Dock Branch, 5 miles 15 chains long, extending from Lancaster to the London and North Western Docks at Glasson. This branch was opened on July 9, 1883. The other is the Morecambe Branch opened in September, 1864. This was originally constructed as a single line. Starting from Hest Bank, 3 miles north of Lancaster, it ran *viâ* Bare Lane to Poulton Lane, Morecambe. In 1888 the London and North Western Company made a loop 46 chains long from Hest Bank South Junction, 1 mile 73 chains north of the Castle station; to Bare Lane Junction, and constructed a new station at Morecambe. Some years ago it was rumoured that the London and North Western proposed to double their line between Tebay and Shap, and to make a small portion in tunnel in order to improve the present gradient; but as yet no action appears to have been taken in that direction.

After the Lancaster and Carlisle line was opened, a passenger could in 1847 leave London at 10 a.m., and reach Carlisle at 9.55 p.m. When the Caledonian line was opened to Edinburgh and Glasgow, that Company, with the London and North Western and Lancaster and Carlisle Companies, arranged for a through express (1st and 2nd class only) leaving London and Glasgow at 9 a.m. and reaching each terminus at 10 p.m. This train began to run on March 1, 1848, and took 2 hours 38 min. between Preston and Carlisle. It continued to start at 9 a.m. until June 1, 1862, when the departures were changed to 10 a.m., and the train became due to leave Lancaster at 4.7 p.m., arriving in Carlisle at 6 p.m. At first it did not stop at Preston, but began to do so in March, 1863, when passengers were allowed 20 min. to dine, the times then being Preston (arrive) 3.23 depart, 3.43; Carlisle (arrive) 6.10 p.m. The train ceased calling at Preston in 1899, when dining cars were added. The "Limited Mail" commenced running between London and Scotland on February 1, 1859, and was limited to three passenger carriages, one each to and from Edinburgh, Glasgow and Perth; but about 1863 a fourth carriage was added. When the mail first started, it left Euston at 8.30 p.m., and arrived in Glasgow at 7.12 a.m. It was the only train that did not stop at Lancaster, taking 2 hours 26 min. between Preston and Carlisle. In 1862 it left Euston at 8.40 p.m. (1st and 2nd class only), reaching Edinburgh at 7.10 and Glasgow at 7.22 a.m. Prior to the inauguration of this train the Scotch mails left and arrived at Euston along with the Irish mails. The writer has to thank Mr. H. H. Meik for his kind assistance in the preparation of this article, and also for the maps and many of the illustrations supplied.

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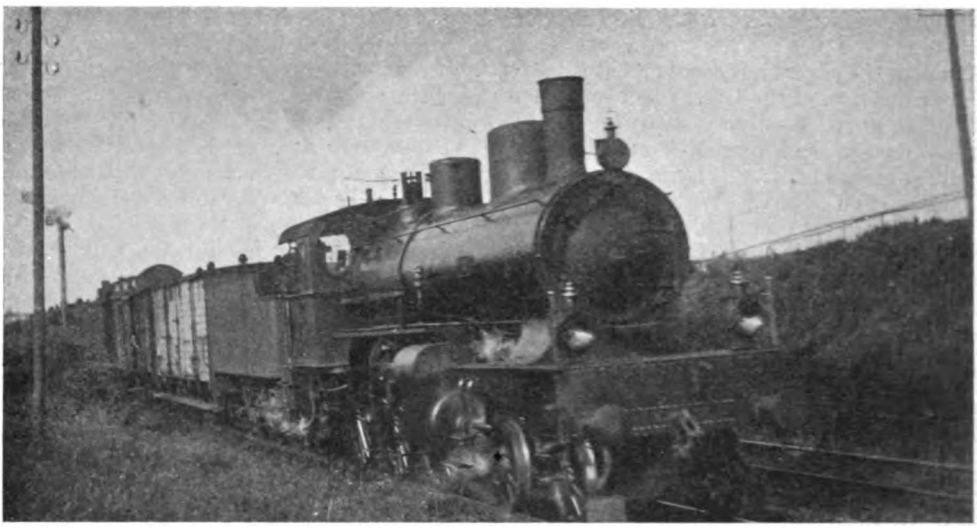

Photo] [*T. Macartney Robbins.*

BAVARIAN 4-6-0 LOCOMOTIVE, NO. 2337, ON LOCAL MUNICH TRAIN.

Leaves from the Log of a Locomotive Engineer [No. XIV.].

By ROBERT WEATHERBURN.

ST. PETERSBURG has, I think inaptly, been called the "Venice of the North." This is due to the remarkable system of canals which form as it were the arteries of the great City, and which the Czar Peter, amidst one of the busiest of lives, found time to plan out and to initiate. There is no figure in Russian history which looms out so significantly and boldly as that of Peter. Judging by the results following his work, one might justly describe him as a genius of the prescient order. Come what may in the shape of revolution and anarchy in the realms of the Czar, it will not succeed by force in the City named after him, for with admirable forethought the many canals and their strategically disposed bridges would place any movement of that kind entirely at the mercy of the military. There is no reason to doubt what is generally affirmed that there is not a bridge of any importance spanning the waterways of the city, which has not been so constructed as to admit of being blown up at a few minutes notice.

One of the peculiar features in connection with these canals at certain seasons of the year is the liability of the water to rise several feet in an incredible short space of time. This is produced by wind and currents in the Gulf of Finland, occasionally setting in with great suddenness, and causing a reaction by backing up the Neva, so that the descending waters from Lake Ladoga with the obstructed outlet, flood the waterways of the City. At such times the floating population are always on the alert, and when the warning sound of the cannon of the fortress intimates the backing up, great commotion ensues. Mooring ropes are triced up, and made taut and secure against accident. The months of October and November are peculiarly subject to these visitations, and many river and canal craft are capsized, or damaged by lack of prompt attention at the fall as well as the rise of the waters.

I was once placed in a very awkward dilemma in the Novo Kalinken canal by such an event. Several flat-bottomed barges, very unsubstantially built—constructed to bring down timber for firewood, and usually broken up after performing that service—had been made use of by the unscrupulous contractor to convey the boilers, frames and tenders, all separately loaded up from the ship, to the place for erection at the end of a blind canal (a branch *cul de sac* from

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the Novo Kalinken). For some weeks these vessels had been slowly making their way to our *cul de sac*, which entered the grounds of the Prince of Leuchtenburg's Fabrique. We had been wearily waiting their advent, every day expecting, but as surely disappointed. We had seen, with bitter regret, the last of the beautiful weather leave us, and incipient frosts begin to crystallize the surface of the canals. All we could do and say in order to get the boats in was of no avail. On the day in question, the first barge containing a boiler with frames was only half a mile away, with no men on board, and this blocked the way in that part of the canal, which was very narrow. The men in charge of the other boats refused to enter the section until the offender had got through, but the whereabouts of the missing crew could not be ascertained. At last after consulting with an English friend some years resident in Russia, I determined, with his help, to pole the delinquent barge into dock, and thus to clear the road for the others. It turned out a much more laborious job than we anticipated, and late at night we found ourselves close up to a low arched bridge over which a road passed.

A short time previous to our getting to the bridge, we had heard the warning gun sound from the fortress, the water rising so fast that on our arrival at the bridge we found to our dismay, that the dome of the boiler would not clear by at least four inches. After thoroughly taking in the position, and knowing that occasionally, the flood lasted for some time, we determined on a somewhat desperate course. In order to carry it out, we went to my friend's house, and obtained a large lantern and an inch-and-a-half augur, two short stakes about three feet long, the ends of which we whittled down to plug shape to suit the size of augur. With these and a short powerful screw jack, we were quickly on the spot, when we found that the position appeared still worse, although the water was not rising so quickly. We bored two holes through the bottom of the boat, one at the fore end, and the other at the stern, and let the water in with the intention of settling the barge deeper in the water so as to allow the dome to clear the crown of the arch. The plan promised to answer admirably, but the light from the lantern was insufficient to give us the general survey of the water to know our true position, and we were anxious to plug up when the dome was just clear.

We had, however, let in so much water that the floating capacity of our craft was reduced to the last margin of safety, as was evidenced by the occasional swaying movement. But at last, with anxious hearts, we saw that the dome top would only just clear the crown. We plugged up, but only after much difficulty and some little trepidation, as the light was so bad that we had to potter and grope for the holes under the water before we could introduce the plugs. It seemed an age of danger and anticipation of evil before we accomplished it satisfactorily. We then forced the barge under the masonry of the arch. We were critically fixed, for the least deviation to the right or left in propelling the boat caused it to wedge fast. We had not proceeded more than eight or ten feet when our efforts at further propulsion were no longer avail, for the dome of the boiler became jammed hard and fast by the slowly rising water. The position—a deadlock under the arch, wet and slimy, with the reflection of the light upon the water, in and out of the boat—was very depressing. Fortunately, my burly friend George was a man of stamina and resource, and seeing that a crisis was rapidly approaching, he at once fell in with the suggestion of using the small screw jack from the top of the boiler against the crown of the arch at a slope or angle, so as to depress the boat, and force it along at the same time. This expedient seemed simple, but the application was both difficult and hazardous. The barge appeared so full of water as to be on the point of foundering and horribly sensitive to every step we took. Our lamp gave but a very limited area of light, and we dare not remove the slide, as the draught through the archway would have extinguished it. To maintain a crouching footing on the boiler and edge of frames, setting the jack or screwing up, when to drop it, or make a false step would precipitate it, or ourselves into the water.

The height of the dome—under two feet—gave but poor headway as we worked, one holding the bottom of the jack and the lantern, while the other set it, and screwed it up. Sometimes it fell with a splash into the water in the bottom of the boat, to be fished out as best we could. Thus we struggled and fought against adverse circumstances in the semi-darkness, almost expecting each moment the vessel to go down under our feet, for each application of the jack, more particularly when we had it too straight up, was accompanied by such a dangerous lurch that forced us to the truth

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of the old proverb, " It is the last straw that breaks the camel's back," and caused us the most lively apprehension as to the result. The further we got the more critical became the position, for the vessel was not alone subject to the weight of displacement, but was also being forced as it were deeper into the water, owing to the dome bearing hard on the stone work, and preventing the vessel rising with the flood, as also producing a singular motion as though the vessel were going to turn over with the dome acting as a pivot.

Bitterly cold and dark was the night, and strange to say we were entirely alone, as that portion of the canal bank and the adjacent land were sparsely occupied, except by a few large, straggling factories and workshops, then closed. So we toiled on, every moment expecting something serious to happen. How we ever managed to hold out, stumbling and fumbling with only one light, and that not a good or handy one, I cannot tell. When rather more than half through, whether the water had attained its highest, I cannot say, or whether the crown of the arch was a little lower, but our efforts were no longer progressive. We were desperate men in a desperate position, when my colleague in a reckless manner proposed to withdraw one of the plugs and let more water in, even if it resulted in swamping. I, having the full measure of responsibility, at last reluctantly agreed to this daring and last resource, but only conditional, that after we had made another trial with jack and lever.

Possibly the knowledge of the danger attached to letting in more water nerved us to greater things, but after setting the jack almost upright, screwing and prising, we were rewarded by seeing the dome graving and scrubbing its mark on the crown of the arch as we forced the barge by sheer pressure along. A little further we went, when, to my intense relief and delight, we found that less and less effort was being required, and that at each setting of the jack instead of moving the barge and scratching the mark only two or four inches, we could now count upon twice and even thrice as much. The further we now went the easier it became, until at last we got the dome clear, emerging from the low-browed, old-fashioned arch, with its dirty green incrustation clinging to our clothing and caps. A little further pushing and poling, and we very unscientifically brought the barge into the branch canal, mooring it under the splendid crane, which had for weeks been in readiness to commence its task of unloading.

The condition of the permanent way on the principal lines of the Empire was not such as would suit the fastidious notions of English railway men, who are accustomed to see everything in that exact condition of setting to gauge with judicious allowance and proper super-elevation at curves, fish-plated and keyed well and closely, with due and proper allowance for expansion and movement—all under the closest supervision for defective rails, or loose keys and fish-plates. Contour and curves of some of the best roads, showed lamentable disregard of that care, and finish which means safety. Curves which should have left the straight, and joined it in such a way as to form a vanishing point insensible to the eye, were more like a series of kinks, rudely, and unskilfully bent at wide distances apart, so that the exact position of application of the rail bending cramp could be detected at a glance. The half-round timber sleepers, however closely pitched, and however broad the flat-bottomed railing, had an appearance of insecurity when chairless, depending for their stability on the rough dogs or spikes, which held them in position.

These conditions, unsatisfactory in moderate weather, became much worse during the great heats of summer, when under expansion with the imperfect allowance. Winter is, however, the time when the most serious disorganisation takes place, not so much laterally as upwards, owing to the water freezing under the sleepers, and forming what are usually known as " frost boils." These lift the rails here and there in the most irregular fashion, causing most unpleasant riding and havoc with the bearing springs. This condition of affairs, with the apathy or indifference of many of the drivers to the looking after, and oiling of their engines when on the road, led to many breakdowns. Heatings of a character rarely seen elsewhere are of frequent occurrence; so that the life of a " chief of a depôt " is at times one of considerable anxiety. Happily the speed at which the trains are run is exceedingly low—probably the slowest in Europe—25 to 35 miles per hour.

It would be wrong to assume that all drivers are the same, for I have often been surprised, during very inclement weather, to observe how successfully the trains are worked on some of the Grande Société lines. Scores of times I have seen the engines of the mail trains so bewreathed with snow

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and ice that only the salient features of a locomotive were discernible. The wheels, generally low, rarely exceeding 60 inches for heavy winter work, and oftener much less, have been one mass of revolving ice discs accumulated from the leaky cylinder cocks, which for obvious reasons were often opened, and left so for considerable periods, the water from which, mingling with the wind-driven snow, freezes up the spaces between the spokes. Slide bar supports, splashers, and brackets and bolts, and every outside projection is partly covered over with snow and ice. Even the whistle, and safety valves are banked up with ice resulting from the frozen moisture. The unreliability of whistles in very hard weather must be taken seriously into account, as when the lower half is frozen it takes some seconds to thaw it. All round, the difficulty of working is seriously increased in winter, and accidents are proportionately large.

I remember an incident of a somewhat remarkable character which occurred at Kharkoff, where I was staying at the time. It was getting late in the autumn, and on the day in question much excitement prevailed, as the Emperor and his son, the Czarevitch, and his wife, were expected on their return from Yalta. Great preparations were being made both by the civil and military authorities, and the railway authorities were not one whit behind in preparing for the run to Moscow. The locomotive selected had been most carefully overhauled, and run for some time previously on the long distance runs. Countless were the alterations made until at last the two most likely engines (one in reserve) were placed on one side, and put under guard.

However farsighted the argus-eyed officials are, it often occurs that a difficulty comes in from a totally unexpected quarter, and so it was in this case. The Imperial party were due to arrive at 5.30, and all traffic was to be suspended two hours before, namely, at 3.30 p.m. About 3.50 p.m. an ominous sound was heard as the bell signal was lowered for a train crossing from the main line to the goods yard, to admit the last train. To those once familiar with the screeching, and half whistling sound made by a tender axle hopelessly hot, with bearing and journal in a half-fused state, and utterly disorganised, it told its own tale. I was at the time seated in the office of the " Natchalni Trakti " discussing some points of theory and practice, when the discordant sounds were first heard. As they came nearer, I rose and went to the window, when I at once discerned trouble. The engine was fortunately moving slowly over from the main line. Yet I could discern, although several hundred yards away from me, that the smoke was curling upwards from the right trailing axle-box and that the alignment of the coping of the tender was awry. Suddenly the engine became stationary, with the tender fouling the main line. The driver and fireman got off, and were evidently surveying the difficulty.

I picked up my hat and, followed by the " Chef Baranoff," hurried to the spot. He was brimful of those choice, but unmentionable expletives with which the Russian language abounds, and demanded from the driver why he had stopped in such an awkward place. A glance at the trailing wheels showed me at once the awkwardness of the dilemma. The trailers appeared partly slewed. The box seemed to have been red-hot, and not a vestige of paint remained for a considerable distance round ; and when I looked at the wheel at right angles, it appeared to be eccentric with the axle-box. This forced the conviction from me that the journal end had just broken off. I was not wrong in my conjecture, as was afterwards revealed, for the bearing brass had been literally torn in pieces by the excessive friction, weight and heat, and lay at the bottom of the keep. Thus freed from control the axle at this end became erratic, and the cast-iron box had broken at the side and top. The bearing spring had forced the broken piece of the box on to the revolving journal, which it had cut away like a knife, the spring always following up the mischief by forcing the broken end down until the journal was twisted off, leaving only a conical stump projecting. The destructive action on the journal had taken place during his journey, but the wrenching at crossing had broken it off, and brought it to a standstill.

Here was a difficulty. Any movement either forward or backward would inevitably make things worse, the defective axle being already jammed crossways as far as the frames and the other axle-box would allow. It was one of those trivial yet trying jobs where the strong man feels he cannot get a " hold." Baranoff cursed, and implored, and cuffed the unfortunate driver and fireman, at once realising that the engine which would bring the Imperial train, and also the engine that should take the train forward, were equally blocked, as this crossing was

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the only way into the depôt. To fetch the Hebeböckers—that is the lifting tackle which consisted of two vertical standards 8 ft. 6 in. high, with screws operated by means of a small pinion geared into a large toothed wheel, and a girder with forked ends which went from one to the other, a total of at least 37 cwts.—would have involved, with their loading up, unloading, and transport half-a-mile away, at least an hour and a quarter. Then there was the lifting and the removal of the derelict tender—an uncertain operation as to time.

Foreseeing the impending delay to the Imperial party, which in no way concerned myself, I nevertheless felt keenly interested in the affair. Seeing some 30 ft. rails of the usual Russian pattern (flat-bottomed) lying close to the fence, an idea entered my mind that the difficulty might be overcome, and delay avoided, by dispensing with lifting. I quickly explained my plan to Baranoff, who in his extremity grasped at anything which might release him from the difficulty. I suggested that if he thought proper to let me have my way, and supplied me with plenty of bone and muscle, all might be cleared before the arrival of the Imperial train, and no one need be officially the wiser. He agreed, and I was speedily supplied with a score and a half of strong-limbed moujiks. A supply of available sleepers were placed, as packing, across the rails about 10 ft. from the tender, and four of the rails were fixed two on each side close together, in a slanting position resting on the abattis of timber, and inclining down until the other ends rested on the sleepers to which they were roughly spiked. These rails—two on either side of the tender—were so placed that the iron buffer-beam or headstock overhung them.

My purpose was to force the hind part of the tender body right up this inclined plane, leaving the defective, and middle wheels on the ground, and, when clear of all impediments, to remove the defective pair, and place the middle pair in their place, thus enabling the tender to be safely transported into the siding or distant sheds. The horn stays were removed from under the trailing and middle wheels, and when the inclined plane was finished, strutted and made secure, the rails were spiked to the packing, and to the sleepers on which they rested. The engine was then uncoupled from the tender, and the drawbar removed. Steam being up ready, and the inclined rails greased, the tender after the first admonitory push gradually slid up, and indeed would have gone too far and struck the packings beyond had I not scotched the pair at the leading end.

It was with great satisfaction that we found that there was room enough left to abstract the defective wheels between the end of the tender and the packings. Another half-hour saw the axle-boxes and wheels changed from the middle to the end, and the tender comfortably on its way to the depôt. It still required 35 minutes before the arrival of the Imperial party, but the news had spread to the civil and military officials that some difficulty had happened, and long before the removal of the tender we were subject to an incessant fire of questions, galling and peremptory, which only tended to bring angry rejoinders from myself. With the removal of the tender, the satisfactory gauging of the road and the running over of an engine to test and see that all was safe, a complete revulsion of feeling took place, and nothing but praise and flattery were liberally bestowed. The train arrived fifteen minutes late. There was as usual a wondrous gathering of the military and civil authorities. Bread and salt were duly presented and tasted, and with no delay beyond that due to previous running, their Imperial Majesties went on, ignorant of the accident which had occurred.

Mr. Weatherburn's next Contribution will appear in the December issue of the "Railway Magazine."

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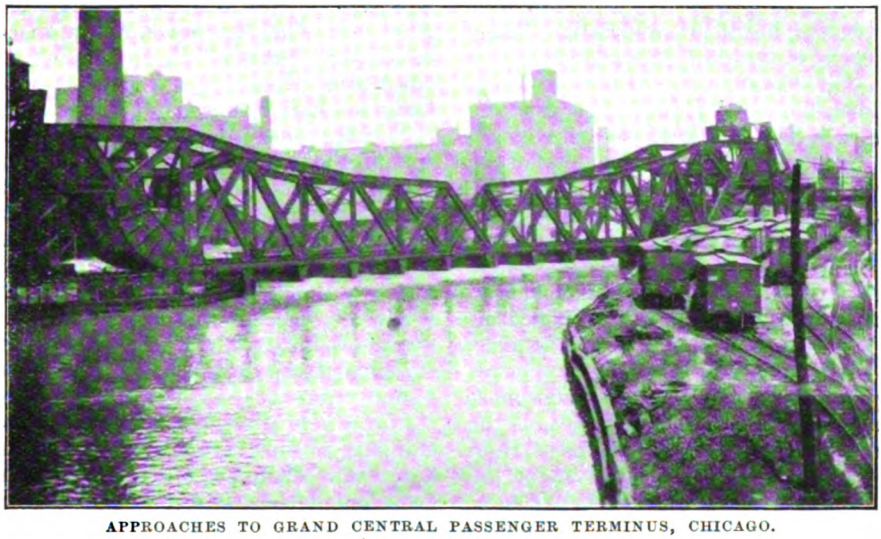
The Railways of Chicago.

By NORMAN THOMPSON.

CHICAGO, one of the world's greatest railway centres, is served by no fewer than 22 long-distance systems connecting the "windy city" with every part of the States, from ocean to ocean, and from the "Gulf" to the Canadian border. In addition, there are a number of belt and other lines which provide terminal and switching facilities between the various railways. Passenger depôts number six, and of these that known as "Dearborn" is the most cosmopolitan, accommodating as it does six different roads covering between them an extent of territory reaching from California to Montreal and beyond. The "Central" and "Union" are used each by four lines, and these three stations may all be briefly dismissed with the remark that the requirements of present day traffic have outgrown their capacity.

La Salle Street depôt is, however, a handsome and commodious structure, and this one also numbers four railways under its roof. Perhaps one of the strongest impressions remaining on the mind after a hurried visit is the astonishing ubiquity of its many news stands. Not far distant may be found the "Grand Central" station, chiefly remarkable for its fine roof, after the style of St. Pancras. Here the Chicago Great Western Railway finds a home, and although boasting a mileage of not far short of 1,500, contents itself with running a total of four passenger trains a day in each direction. One of these is actually made up of but a solitary passenger coach with a string of vans in front! Shades of Paddington! In passing, it may be mentioned that, appropriately enough, one may journey to Devon by this line, although the "Great Western Limited" passes that station without stopping.

Two more railways—the "Baltimore and Ohio" and the curiously named "Père Marquette"—help to render this depôt more lively. For a long time past, civic Chicago has been much exercised in regard to the problem of the concentration of all the individual railways in one Union passenger depôt, and this question is still under discussion. Meanwhile the Chicago and North Western Railway has taken action, and provided itself with one of the most handsome and completely equipped passenger terminals in existence. The style of architecture is the early Italian renaissance, and the building contains several novelties not invariably associated with railway stations. Thus within its precincts are to be found a



APPROACHES TO GRAND CENTRAL PASSENGER TERMINUS, CHICAGO.

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ILLINOIS CENTRAL TRAIN AT GRAND CROSSING, CHICAGO.

post office, drug store, hospital and nurses, with many other features designed to add to the comfort and welfare of passengers.

The marble waiting hall possesses a unique self-supporting ceiling, decorated to represent suitable subjects, such as locomotive driving wheels, headlights and bells. Facing three streets, the station is a worthy addition to the architectural assets of the city. There is a train shed of the "Bush" type, covering 16 tracks. The "North Western line" carries on quite an extensive suburban traffic on its two main divisions, the "Milwaukee" and "Galena" lines. Taking the latter route, the arrangement of the tracks is such that the through lines are in the centre (four in number), with the local tracks on the outside, separated opposite the platforms by an ugly wooden fence. The railway is carried on a concrete-faced embankment, with openings at the cross roads, and a most curious state of affairs is in evidence, as the Elevated Railway, having descended from its lofty estate above the city, runs at the street level, parallel with the North Western, thus causing the objectionable grade crossings which are avoided on the latter. Crossing poles, automatic bells, and flagmen are stationed at each street intersection—a very necessary precaution.

Quite an interesting study is the Chicago Elevated Railway system. Originally projected as quite independent of one another, the four main lines with their respective branches have been united by the construction of the Union Loop, which in the form of a rectangle, encloses the business section of the city. These four divisions are known as the "Metropolitain," "Oak Park," "North Western," and "South Side." The first two serve the western districts, and the extent of the others is sufficiently indicated by their titles. Mileage has now reached 70, and the number of cars nearly 1,500. The system dates from 1892—two years after the opening of the first of the London tubes—and for five years the trains were worked by steam locomotives, but electricity has since been the motive power. Trains run round the loop at intervals of 42 seconds, the South Side and Metropolitain entering on the South end, and traversing the inner track; the other two utilising the outer track, which they strike from the North. The original "stub" terminals are still used during the "rush" hours to relieve pressure on the loop. The letter "L" is employed as an abbreviation to indicate stations on the Elevated. One catches a reflection of the celebrated "hustle" in the notice to the effect that "Passengers are not permitted to leave the cars by means of the windows!"

Turning once more from electricity to steam, the local suburban service of the Illinois Central claims attention. Main line traffic is dealt with at the Central Depôt, but there is a valuable extension of the suburban tracks through a shallow cutting in Grant Park to Randolph Street terminal, situate where the Chicago river enters the lake. The service is an excellent one, trains running throughout the day at 5, 10, or at most 15 minute intervals. 67th Street is a transfer station where passengers can change from a stopping to an express suburban train and *vice versa*. There are 6 or 8 tracks, and the local line platforms are raised level with the floor of the cars, the main line ones being of course level with the metals.

Names of some of the places reached have a familiar ring to "old country" folk, such as "Hyde Park," "Kensington," "Cheltenham," and "Windsor Park." Destination boards are carried by the engines on the sides of the smoke-boxes. The fast trains run on very quick schedules, and there is an air of alertness about the working that instils a comforting conviction that one will be "on time." To attempt to find a reasonable explanation for American railroad nomenclature is a thankless task. Some of the titles are too hopelessly cumbrous for daily use, and the roads in question cheerfully acquiesce in the substitution

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of their nicknames. Others are almost painfully abrupt, including the "Erie," "Wabash," "Monon." Examples of the opposite extreme are "Minneapolis," St. Paul and Sault Ste Marie ("Soo Line"), "Cleveland," Cincinnati, Chicago and St. Louis ("Big Four") and "New York," Chicago and St. Louis ("Nickel Plate"). On a par with this diversity of practice is the stolid conservatism that invariably paints passenger coaches a dark green, contrasted with the policy which produces a startling yellow livery on two lines running to the North and North-West, a district in which the street cars in various cities also conform to the same colour scheme.

Mention of Milwaukee brings to mind a section of track that for spotless upkeep and the neatness of its immaculately-kept bordering lawns must be hard to beat. The route lies through a residential district of great beauty, to the northward of Chicago, and the railways conform to the dictum that in this neighbourhood at least, "Every prospect shall please." Its stations are all neat and picturesque, though differing a good deal in style, and such familiar adjuncts as coal wagons and freight sheds are conspicuous by their absence. In addition to the trunk railways and facilities for lake travel, these cities of Chicago and Milwaukee—85 miles distant—are connected by a double track electric railway, and inter-urban lines of this description radiate all round, linking up more than 30 towns and villages with Chicago, and, in some instances, with each other. If not to China, one can at least take a trolley trip to Peru, or should Geneva or Marseilles be the desired destination, the electric lines are equally ready to offer quick and comfortable transportation.

A few remarks may be added concerning the freight transfer railways, which are particularly numerous, extending for miles in circles round the city, interchanging traffic between all the trunk lines, affording trackage and switching accommodation to manufacturers and trading firms, as well as providing communication with the docks on the lake at such points as Waukegon and South Chicago. Of these the most extensive is the Baltimore and Ohio Chicago terminal, which also owns the Grand Central passenger depôt. The mileage is 289, and a somewhat sparse suburban passenger service is provided, consisting of four trains in either direction, reaching Blue Island and Chicago Heights. Then there is another important line, the Elgin, Joliet and Eastern. Starting from the lake shore North of the city, this road encircles it on the North, West and South sides at a radius of from 30 to 40 miles terminating at the lake shore again, and covering a distance of 226 miles, including several branches. Next comes the Chicago Junction, with 145 miles of track, followed by the Chicago, Milwaukee and Gary (128 miles), which also conducts some passenger business. The list of lines running to more than 100 miles is completed by the Indiana Harbour Belt and the Chicago Union Transfer Railway. Nine other roads are in existence, the individual mileage of which dwindles to $1\frac{1}{4}$ in the case of the Manufacturers' Junction Railway.

The Chicago and Western Indiana Railway furnishes terminal facilities at the Dearborn depôt, in addition to which it also runs a short suburban passenger service. Another interesting railway is known as the "Illinois Tunnel System." This connects with the basements of commercial houses, where it delivers freight, thus assisting in lessening congestion caused by handling freight in the streets. The line is worked by electric power, and passes beneath the Chicago River no fewer than 11 times.

CHICAGO ELEVATED RAILWAY.

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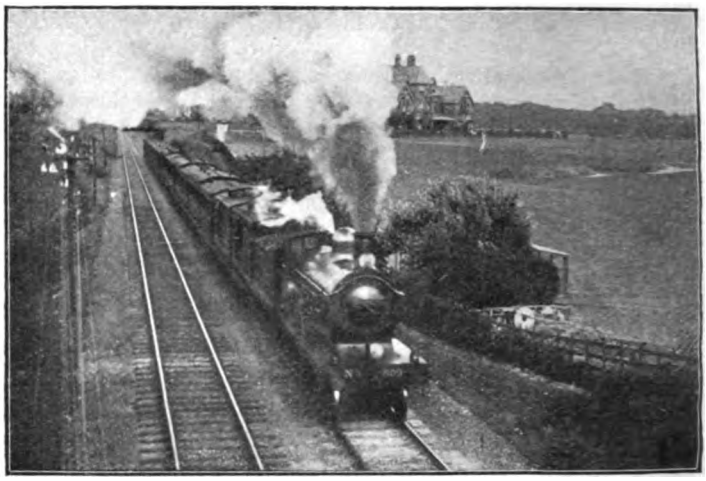
South Eastern Coast Services.



Photo] [*W. Faulkner.*

KENT COAST TRAIN NEAR BIRCHINGTON.

THE South Eastern and Chatham Railway have, in conjunction with the Great Northern, Great Western, London and North Western, Great Central, and Midland Companies, arranged through express services on week-days during the winter months from the northern, midland, and western counties to the popular coast resorts of Kent and Sussex, including Deal, Dover, Folkestone, Sandgate, Hythe, Margate, Ramsgate, Hastings, St. Leonards, and Bexhill.

By the Great Western and Great Central lines passengers (first and third class) are conveyed from Liverpool (landing stage), Birkenhead (Woodside), Chester. Wrexham, Shrewsbury, Wolverhampton, Birmingham (Snow Hill), Warwick, Leamington Spa, Manchester (London Road), Bradford and Halifax (Lancashire and Yorkshire Railway), Huddersfield, Sheffield, Nottingham, Leicester, Banbury, and Kidderminster. The same trains connect with 23 other Great Western stations, as also with 27 on the South Eastern and Chatham, so that by these three systems alone the south coast winter services link no fewer than 68 separate towns in different parts of the kingdom. A dining car is run from Birmingham to Birkenhead, and in the opposite direction from Birkenhead to Leamington Spa.

London and North Western through coaches are carrying passengers *viâ* Addison Road, Kensington and Willesden Junction, from 27 stations in the midlands, the north of England and Scotland, and by the same association the largest industrial centres on the Lancashire and Yorkshire system are similarly connected. Luncheon cars run between Willesden and Crewe, as also from Stafford to Willesden. The service from the London and North Western to the South Eastern and Chatham joins the new continental service from Dover Pier at 6.5 p.m., by which travellers arrive in Paris at 11.25 p.m.

By the Midland Railway 22 stations are reached, and passengers to and from the south coast resorts mentioned have the advantage of restaurant cars from London to Nottingham and Manchester, as well as from Bradford, Leeds, Sheffield and Manchester to St. Pancras. On the Great Northern system, the through services connect 27 important stations, and luncheon or dining cars are run to and from King's Cross. In certain cases a change from one coach to another is necessary at Herne Hill, but as the trains stand on roads at the same island platform, no inconvenience is thereby experienced. When necessary, the whole of the trains can be heated by steam, and the journeys in each direction are therefore made under the pleasantest conditions. These services will remain in operation until June 2, next year, but they are suspended on Bank Holidays. We may add, for the information of golfers, that there are 25 excellent links in the vicinity of the health resorts thus served.

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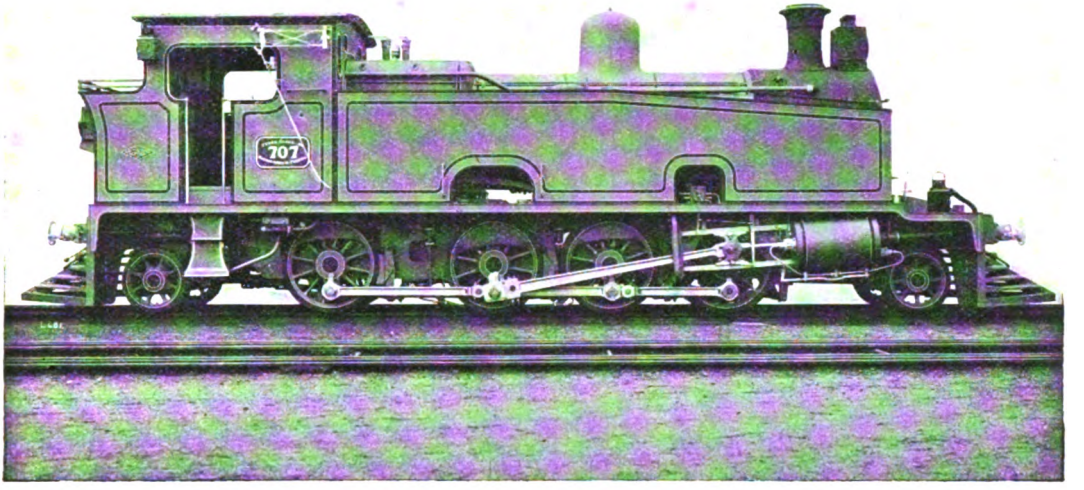

BUENOS AYRES PACIFIC RAILWAY:
2–8–2 tank engine fitted with Schmidt superheater.

The Schmidt Superheater as a Factor in the World's Locomotive Practice.

IT is doubtful whether any patented device of a comparable character has ever paralleled the situation created by the Schmidt superheater, bearing in mind that its employment entails the payment of royalty fees, and that it is a business proposition as well as a factor in locomotive engineering. There is nothing specially new in superheating. It was advocated in early years. Richard Trevithick—"The Father of the Locomotive Engine"—was, in fact, one of the pioneers of superheating as regards stationary practice; and many well-known engineers have been concerned therewith, some of them suggesting the application of superheating apparatus to locomotive engines. The initial proposal of importance is, however, considered to be that of a French locomotive engineer, Mons. Moncheuil, who in 1850–2 obtained patents for a superheater including to-and-fro lengths of tubing placed in large boiler tubes. There is no record that his designs ever proceeded beyond the "paper" stage; and most succeeding proposals were of smokebox or "steam-dryer" type, including the superheaters tried by Mr. J. F. McConnell on the London and North Western Railway in the early 'sixties, some of the "Bloomers" being fitted experimentally.

It is, however, with the work of Dr. Schmidt that the history of locomotive superheating really commences; especially as he inaugurated the policy of high-degree superheat, which policy is the secret of the results which have followed. He had been concerned as an experimental scientist engineer in investigations concerning mixtures of superheated air and steam; and from this he gradually diverged into locomotive practice. A number of superheater designs were produced, and some of these have been adopted in stationary and marine engineering; but for locomotive purposes the original apparatus was of smokebox tubular type, with, however, a large flue

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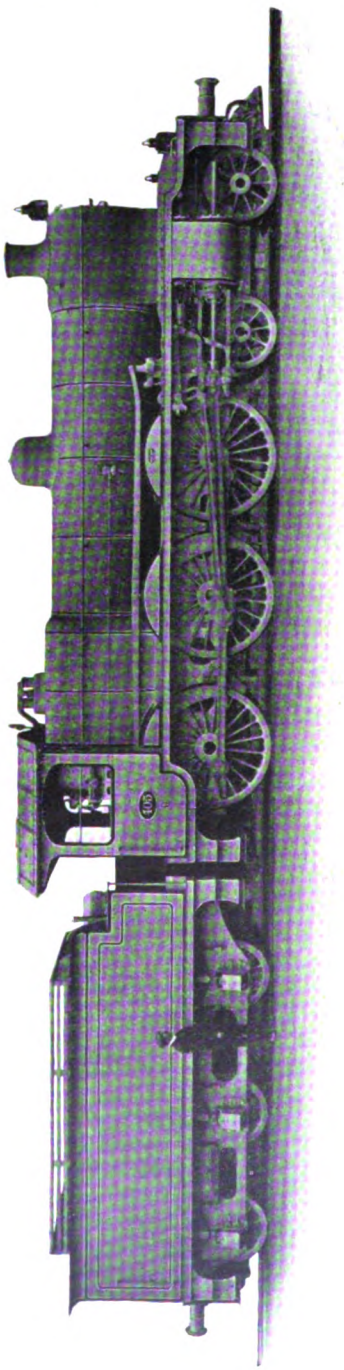
conveying a portion of the furnace gases directly to the superheater. The initial equipments were tried on the Prussian State Railways, this being rendered possible mainly because of the co-operation of Messrs. Garbe & Müller, of the Prussian State Railway Administration. It is worthy of special remark, particularly in view of the charge which is sometimes unjustifiably made that for any notable development in practice we have to go abroad, that at this time, while initial experiment and development occurred in Germany, Dr. Schmidt was actively supported financially mainly in this country. Indeed, had it not been for the liquidation of Messrs. Easton & Anderson, who were closely associated with earlier progress, and the consequent delays and reorganisation involved thereby, it is probable that this country would have figured more prominently than it has done until recent years. In fact, British association with the Schmidt apparatus has always been an important factor, though in connection with reorganisation and the centralisation of direction at Cassel, the English company—now Schmidt's Superheating (1910) Co., Ltd.—has become one of the associated concerns, the other being the Locomotive Superheater Co., of New York.



GREAT INDIAN PENINSULA RAILWAY:
4–6–0 express locomotive fitted with Schmidt superheater.

The original engines showed that superheating offered decided possibilities; and the two trial engines built in 1898 were followed in 1899 by four others. These provided material for investigating the special problems introduced by the high temperatures of the steam; and in due course special designs of pistons, piston valves, stuffing boxes and other parts were introduced to meet the new conditions created. At this period, however, there were many disappointments and difficulties, and although trial engines with the same apparatus appeared on the Moscow-Kazan, Belgian State, Canadian Pacific, Cape Government and other lines, successful operation did not realise notable results. The firetube superheater then followed—with, however, only a twofold steam path, two elements being placed in each large firetube—the initial equipments being made by Mons. J. B. Flamme, on the Belgian State Railways in 1902. This design quickly obtained wider acceptance, and although it has since been developed to include a four-fold steam path with looped connections, each firetube containing only one such element, in other respects the same features are still retained. It is this form which has principally provided material for subsequent developments, gradually finding favour in all countries until it is now included in the practice of nearly 450 railways or railway administrations and as many or

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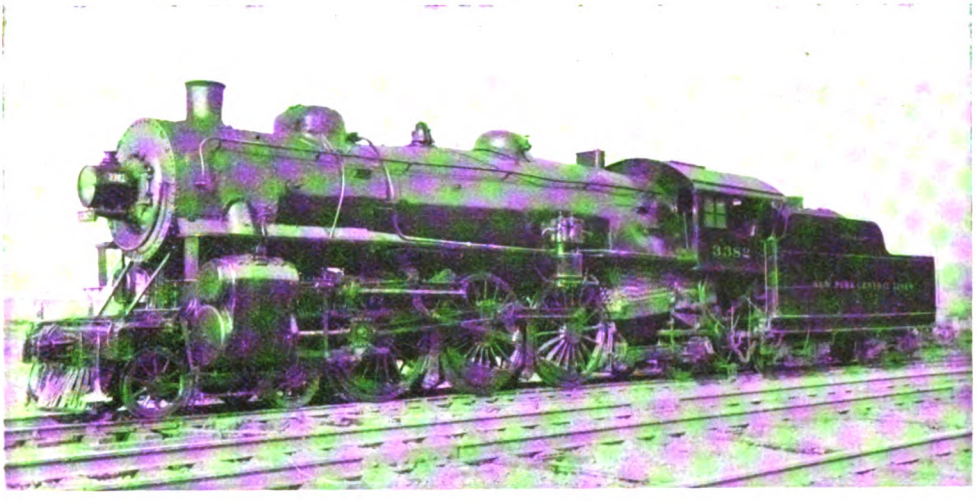
more independent locomotive engineers; is employed for upwards of a 1,000 distinctive designs, ranging from enormous Mallet locomotives in America and elsewhere, Garratt and other articulated engines, big express engines, and passenger, goods and tank locomotives of all classes, to narrow gauge tank locomotives such as those of the County Donegal Joint Committee; and has realised the phenomenal total of 25,000 equipments.

Progress was not, however, very rapid for several years, seeing that in most cases extended trial of the original equipments was necessary before engineers would commit themselves to further installations. In fact, it was not until the middle of 1910 that 5,000 equipments was recorded. Since then, however, development has been much more rapid, the second 5,000 being completed in September, 1911, the third in January, 1912, and 20,000 was reached in January of this year. Now the total of 25,000 is recorded, and in view of the fact that the employment of the Schmidt, or indeed any high degree superheater, entails definite committal to the policy of superheat and influences the design of locomotives to which it is fitted, there is good ground for the special celebrations at Cassel, attended by locomotive engineers from all over the world, held on October 11th. The figures given above do not include the Swindon, Cole, Vaughan-Horsey, Emerson and other designs which are also now in the hands of the Schmidt companies.

It may be that had Dr. Schmidt not initiated his characteristic line of superheater design the same or another division of practice would have found favour, in view of the necessity for considering all possible means of increasing locomotive capability and efficiency to meet modern requirements. It may also be said that Dr. Schmidt provided what was wanted at the psychological period. But the fact that his apparatus appears to satisfy all economic, maintenance, operative and practical criticisms, bears witness to the high quality of design and construction associated with the Schmidt superheater. It is probable that these aspects have had as much to do with the success which has followed—slowly but surely—as the quality of invention involved; but the fact remains that the Schmidt superheater has in due course realised a situation which is unparalleled, and is for that reason worthy of special comment and consideration. Moreover, in no single known instance has the apparatus been removed because of inefficiency, practical difficulties or condemnation, though in a number of cases provision was made for alteration if found necessary.



NEW YORK CENTRAL AND HUDSON RIVER RAILROAD:
4–6–2 locomotive, fitted with Schmidt superheater.
This engine, for the photograph of which we are indebted to the Superintendent of Motive Power of the New York Central and Hudson River Railroad, is one of a class described in detail in Mr. W. G. Landon's article on "Recent American Locomotive Practice," published in the October RAILWAY MAGAZINE.

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Mr. G. J. Churchward was responsible for the first Schmidt superheater included in British practice, the 4–6–0 engine No. 2901, *Lady Superior*, being fitted in 1906. He has since adopted the Swindon design; but Messrs. G. Hughes, H. A. Ivatt, D. Earle Marsh and other engineers responsible for the earlier English equipments applied it to many engines, in every case acknowledging special satisfaction; while the record of subsequent progress covers virtually every large railway, besides several smaller ones, in the kingdom. It is a matter of common knowledge that the Schmidt apparatus is now a standard feature of locomotive practice on the London and North Western Railway; while the inclusion of at least one new engine fitted with this apparatus, and continual references to the work of engines so equipped in almost every issue of the RAILWAY MAGAZINE, affords abundant evidence that the claims advanced in its favour are in no way exaggerated and that its almost universal acceptance is a real fact. There is no need to select examples of notable work done by Schmidt superheater engines; for one can hardly make a lengthy journey without being drawn at least part of the way by one of them. On shorter journeys they are continually being met with, while it is quite a usual thing for all the engines working a long-distance train—say from Euston to Glasgow, Edinburgh, Perth or Aberdeen, or from King's Cross to Edinburgh—to be of Schmidt superheater classes. Abroad the situation is quite as remarkable, and Schmidt superheater engines are now found in virtually every country under the sun, in Europe, the United States, our own Colonies and dependencies, the Far East, Africa, Asia, and South America.

The organisation of the Schmidt companies may be referred to. In Germany there is the Schmidt'sche Heissdampfgesellschaft G.m.b.H. in Cassel, with the Schmidt's Superheating (1910) Co., Ltd., in London, and the Locomotive Superheater Co. in New York as associates. Each has its recognised area, with a few countries as common ground. Dr. Schmidt exercises general supervision and technical direction, with a chief engineer, assistant and travelling engineers, and commercial representatives in the respective countries. The services of these engineers are available for every railway where the Schmidt superheater is adopted, to deal with initial difficulties and practical problems which have arisen, particularly when first introduced. In large measure the success which has followed is attributed to this organisation as carried into practice, and to the assistance rendered by those who have been associated in this way with Dr. Schmidt and his colleagues.

Photo] [*W. M. Smith.*

GREAT NORTHERN RAILWAY:

3.25 p.m. down Accrington and Blackburn Express.

Inside cylinder 4–4–2 (Schmidt Superheater) locomotive No. 271.

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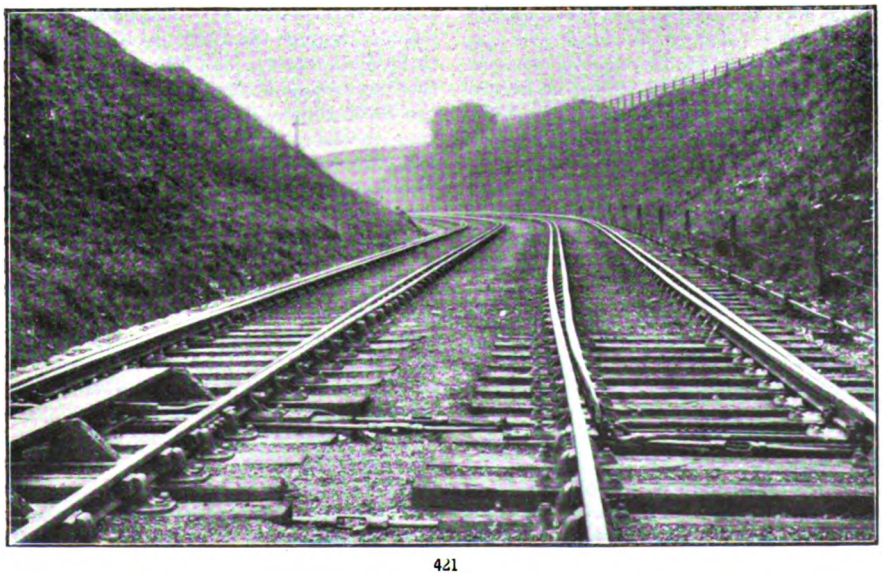
A Peculiar Railway Junction.

(Photos by F. E. Mackay.)

The junction illustrated by the two photographs reproduced is peculiar in that, for engineering reasons, the points are located some distance away from the actual separation of the direct and branch lines, the respective tracks being gauntletted, as shown, from one position to the other. Readers are invited to specify the railway and the place where this arrangement of tracks is to be found.



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PERTINENT PARAGRAPHS

The Channel Tunnel.

AT the first congress of the Franco-British Travel Union, held at Marble Arch House—the home of the French Institute in London—chief place in the programme was given to the proposed Channel Tunnel. to which subject the evening meeting after the inaugural proceedings was exclusively devoted. Baron Emile d'Erlanger (chairman of the Channel Tunnel Company), who presided, gave an exhaustive account of the scheme in its military, financial, and commercial aspect, and was followed by Sir Francis Fox, the eminent engineer, who was personally concerned in the construction of the Mersey, Rotherhithe and Simplon Tunnels. On the following day, M. Palmié (correspondent of *Le Journal*) and Mr. W. Turner Perkins contributed papers on "The Channel Tunnel and Franco-British Relations," the latter calling particular attention to the very considerable change which public opinion has latterly undergone in this country favourable to the proposed tunnel. The congress afterwards unanimously adopted the following resolution:—

"That this Congress, considering the importance of the proposed Tunnel in the relations of Great Britain with the whole Continent, expresses the hope that the British Government may see their way to approve of the scheme, which is now being so very favourably received by the people of this country; and it expresses great satisfaction that the project has been submitted for consideration to the Committee of Imperial Defence."

The meetings held during the week, grouped under nine different headings, were devoted to (1) transportation, (2) Customs, (3) accommodation for visitors, (4) attractions and sports, (5) travel publicity, (6) education and travel, (7) travel in the Colonies, (8) climatology, (9) miscellaneous. Support to the Congress was given by the Great Eastern, Great Northern, London and North Western, London and South Western, and Midland and East Coast Joint Railways. Representatives of nearly all these Companies also attended, and paid careful attention to the subjects in which railways were particularly concerned. An effective display of the coloured posters of the same systems was seen on the main staircase, and the walls of the large hall were covered by sections and plans showing the proposed Channel Tunnel, as also the completed Mersey, Rotherhithe and Simplon Tunnels. A dinner at the Hotel Cecil followed the Congress, which was acknowledged to have served a most valuable purpose in the interests of the Franco-British Tunnel.

* * *

The Western Railway of France.

A SUBSCRIBER to the RAILWAY MAGAZINE, who has recently left Paris, and gone to live at Dallas, in Texas, writing to us on September 19th last, says:—

"Referring to your quotation, in the September issue, of the *Daily Graphic's* article *re* railway nationalisation, concerning the taking over by the French Government of the Western Railway of France, the *Daily Graphic's* 'expert' should take a few journeys on the aforesaid railway, and see for himself the numerous improvements which have been made since the railway came under government control. Sometimes figures do not say much, and this is the case, as, several years before the Western Lines were taken over by the Government, no improvements whatever were made. Only the smallest possible orders for rolling stock and motive power were placed, so that, when the Government took over the road, most everything had to be made anew. You have quoted yourselves the improvement made from time to time in the Paris-Dieppe-Newhaven service, and lately gave the news that a new cutoff, *vid* Pontoise, had shortened the trip from Paris by some 20 minutes, I believe. No such improvements were ever made by the Company. Again, you stated a few months ago, that a new road would be built between Havre (my home town) and Paris. This new road we have been asking for some thirty years without any results. Last summer, when I went from Havre to Paris, they were replacing the track in many places, and this summer they were still at work. They are now, for instance, going to put a new bridge in commission at Rouen, the actual one being so unsafe that trains have to slow down to some 6 miles an hour; and from Rouen to Paris, you can see many sections working on the tracks. Well, the *Graphic's* 'expert' himself will

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acknowledge that all these improvements have to be paid for, and that the State is not responsible if tracks, bridges, etc., and new lines are to be built, as really they have not become unusable since 1909 only, and if the former Company had taken better care of their property, maybe the system's financial position would be much better now. As to the employés, they are better now than under private management, and there is not so much politics mixing in the 'Ouest-Etat' as the adversaries of State management want us to believe.

"Compare the train service with what it used to be a few years ago. The trains now are always on time. In fact, two months ago, in Havre, I went to meet a friend at one of the afternoon expresses from Paris and was informed at the station that the train had arrived 15 minutes ahead of time. Again, the rolling stock is now, at least, equal to the other French lines. Compare the third-classes of the O.-E. with those of the Nord system, for instance, and you will find that, excluding a few crack trains between Calais and Boulogne, and Paris, the other trains are equipped with cars that might have been the last word in rolling stock twenty years ago, but which are now good for the scrap heap."

* * *

A High Speed Line to the Crystal Palace.

ONCE more a Kearney high-speed line from the Strand to the Crystal Palace is suggested, and the statement has been made that a mono-rail bill will forthwith be deposited, for consideration in the next session of Parliament. We doubt, however, whether such a line could ever prove remunerative. Its revenue would depend almost exclusively upon the traffic to the Palace itself, and the days in the year when enormous crowds have to be conveyed thither are exceedingly few. Nor can it be suggested that the railway accommodation existing, as provided by the London, Brighton and South Coast and the South Eastern and Chatham systems, is inadequate. The lines of the first-mentioned from London Bridge and Victoria, already electrified, are, indeed, capable of meeting much greater demands than any which have yet been experienced, and if opposition were seriously threatened it would, we believe, be found that the Managing Committee of the South Eastern and Chatham are fully prepared to incur expenditure which would enable them to double the carrying capacity of their lines to the high-level station on Sydenham Hill.

* * *

Strengthening the Forth Bridge.

OUR weekly contemporary, *Engineering*, recently described in detail the important strengthening and renewal work which is about to be commenced at the Forth Bridge. When this famous structure was designed, more than 31 years ago, the loads and the train speeds calculated for were considerably in excess of those then assumed as probable for a long period of time, but progress in these respects, particularly in the weight and power of locomotives and the loads behind them, has advanced enormously. Therefore, although the limits have not yet been reached, so far as the strength of the bridge is concerned, the directors of the Forth Bridge Company have decided further to reconstruct part of the flooring and troughs in which the railway track is laid over the bridge. The work is to be carried out by the original builders, Sir William Arrol & Co. (Limited), and Messrs. Baker & Hurtzig will be the engineers for the work, in association with the engineer-in-chief of the North British Railway Company, Mr. W. A. Fraser.

To show the great development in traffic over the bridge since it was opened, over 23 years ago, *Engineering* mentions that the total number of trains per annum has increased from 37,610 to 52,944, or about 40 per cent., while the collective weight has advanced from 9,941,612 tons to 15,894,410 tons, or about 60 per cent. The 23 years' total is 1,191,500 trains and engines, while the collective weight is 317,271,789 tons. The average weight of the trains 23 years ago was about 260 tons; last year it was just under 300 tons. When the Board of Trade tested the bridge before it was opened they chose the heaviest locomotive belonging to the North British Railway Company, who were to work the traffic. These, it is stated, were only of 73 tons, including tender, the axle-load being under 16 tons. Now there are in regular use locomotives of the Atlantic type with weights—including tender—of over 120 tons, the maximum axle-load being 20 tons. In addition, there is the all-important question of speed. That the structure has stood the test of such increasing severity proves not only that the original design was satisfactory, but that the upkeep and maintenance have been thorough, everything being in satisfactory condition. It is estimated that 2,500 tons of structural steel will be required for the renewal of the troughs and floor from end to end of the bridge; of this total the addition to the weight of the present steelwork of the bridge is only 750 tons. This, in a bridge which required 54,160 tons of steelwork, is insignificant, and proves further the splendid character of the original conception and workmanship and the care exercised in maintenance. The work will take some years to execute, as operations can only be carried on during summer months, and it is proposed not to interfere with traffic on week days, while even on Sundays one line only will be closed.

* * *

Tail Lamps.

APROPOS of the Aisgill accident on the Midland Railway, a reader sends (too late for reference in our last issue) some comments concerning the tail lamps shown by the train which was run into; and as the subject appears to be one of interest, we may allow him to state his own case, though we do not necessarily associate ourselves with, or endorse, his remarks. He writes as follows:—"Until a few years ago all passenger trains were protected by three oil-lit lamps, showing red or danger lights, attached to the end of the last vehicle on the train, and when burning brightly these lights were clearly visible at great distances whether the train was

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running on a straight piece of track or on a curve. From the position of the lights the signalman could see at a glance as the train passed his cabin if all lights were burning clearly. If by chance a lamp had gone out it was a simple matter to notify the man in the next signal-box to have the train stopped and the lamp re-lit. Since the introduction of gas and electricity as illuminants, and more particularly in the newest railway coaches, the three red lights on the end of the last carriage or van are in many instances done away with. The position on most trains now is to have one oil-lit red lamp attached to the end of the last vehicle, other two lights, one on either side, being shown by gas-lit lamps projecting from the sides of the van, not at the extreme end, but projections from the centre of the vehicle. The red discs on these lamps are very small, and are sometimes so thickly covered with dust and smoke as to be scarcely visible. When extra carriages are attached at the end of a train the last carriage carries only one danger lamp, and the two side lights come from the van which may be two or three vehicles from the end. With danger lamps placed in such a position it is only on a perfectly straight line that all three lights are visible. The slightest curve causes one or other of the side lights to be hidden from view. I understand the line is slightly curved at the point where this accident happened, and judging that the rear lights of the Glasgow train were placed in the position now so generally adopted on modern passenger trains, I am of opinion that had three lights been attached at the extreme end of the last vehicle, as the custom used to be, the driver of the Edinburgh would have had a better chance of observing the disabled train in front, possibly in time to avert a collision, or at least, to reduce speed to such an extent that the force of the impact would have been lessened, and perhaps to-day, we would not have been mourning the loss of so many valued lives. Everything should be done to make railway travelling as safe as possible, and a return to the old system of three red lamps at the extreme end of every train is, I think, necessary for the safety of those who travel on our railways."

* * *

The Pennsylvania Railroad and the 1913 Floods.

Now and then this country suffers from the results of excessive rain, but, fortunately, such occurrences as the East Anglian floods in the summer of 1912 are extremely rare, and as yet we have had nothing which is really comparable to the floods which devastated certain of the United States—Ohio and Indiana especially—at the end of March this year. In Ohio there were destroyed 22,000 houses, while 35,000 were seriously damaged by water. The Pennsylvania Railroad (lines west of Pittsburgh) suffered at least as heavily as any other system affected, and a map prepared by the company shows that through traffic by any route was impossible for some days, notwithstanding that in the area involved there is an elaborate series of connecting and inter-connecting sections, providing normally at least two and generally three, four, or more alternative routes to every junction station. A brochure has been issued by the Pennsylvania Company, which tells the story of this terrible flood, and details the difficulties raised and the means adopted to get traffic moving again as quickly as possible. A series of photographic reproductions show even more graphically the conditions created—bridges down in all directions, houses swamped, stations flooded to the eaves of the buildings, streets 15 ft. deep in water, embankments washed away, railway tracks left suspended, carriages and wagons stranded in all directions. On the Pennsylvania Railroad alone there were 74 steel bridges entirely destroyed or rendered impassable for trains; and there were thousands of wash-outs, ranging from comparatively small breaks to sections of roadbed two miles in length. Nineteen passenger trains were marooned, being backed or pulled on to high ground and the passengers fed and housed in the trains or as convenient. Several men on one train being stranded near a printing office, amused themselves by getting out a newspaper, which they called "Pan Handle No. 10," that being the official designation of the train concerned. Twenty-four bridges were destroyed entirely, 50 seriously damaged, 39 spans were lost, and 48 damaged, making totals of 3,597 ft. of track destroyed entirely and 4,189 rendered impassable. This applies only to bridge tracks. Of ordinary road 135 miles called for heavy repairs. There were also heavy expenses involved in repairing damage to stations and buildings, equipment and telegraphs, representing a direct property loss to the Pennsylvania alone of nearly £1,000,000. We may add that copies of the booklet referred to may be obtained on application to Mr. Ralph H. Baker, Colonial House, Liverpool, on mentioning the RAILWAY MAGAZINE.

* * *

Week-End Tickets.

THE recent police-court decision that the holder of a week-end ticket to Brighton issued on a Friday and who was required to pay excess in order to return on the Saturday, is entitled to redress, strikes at the root of the cheap and special fare policy of British railway companies; and for that reason the result of the appeal which has been entered by the London, Brighton and South Coast Railway will be anxiously awaited. It is useless to refer to anomalies created by the issue of special-fare tickets. One can often make long journeys more cheaply than shorter ones. It is also possible to travel at less expense by staying over from Friday to Tuesday than by returning the same day (unless day excursions apply); and the use of only one half of an excursion ticket renders one liable to the accusation of fraud. All these facts are well known; but the anomaly disappears when the situation is properly considered. As a daily contemporary remarked: "Fancy going to a merchant after his sale is over, and asking for goods at sale prices! The goods are offered only at a special price within a limited period. A railway ticket, in the same way, is available only as specified, and if the public are allowed to do as they like, and to take advantage of the special privileges given to excursionists to the detriment of ordinary passenger traffic, the railway companies would soon be brought to

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MOSELEY STATION: MIDLAND RAILWAY.

the verge of bankruptcy." There are no Parliamentary or legal obligations in regard to excursion or equivalent arrangements, and it has been held more than once that if a ticket on the face of it states that there are conditions, or if the passenger, in fact, knows that there are conditions, he is bound by them, whether he choose to read them or not. The conditions attending the issue of week-end, excursion, and other special tickets are usually clearly stated on handbills, posters, and often on the tickets. It remains to be seen whether the result of this appeal will reverse the generally accepted ruling, that in offering special arrangements railway companies are entitled to insist upon specific conditions being complied with.

* * *

Moseley Station: Midland Railway.

REFERRING to Mr. Groves' article, published in our September number, Mr. W. J. Parker suggests that the writer has not done justice to Moseley Station; and in support of his contention has sent a photograph of the station—reproduced herewith—with particulars of the traffic and conditions. He says:—

"It is a question whether there is, in the United Kingdom, a greater contradiction, and to the stranger a greater surprise than Moseley Station. As may be seen from the accompanying photo, which is by no means a flattery, one might easily suppose this station to be in some rural and secluded corner far away from the 'busy haunts of men.' And yet this is a *town* station, and only three miles from the centre of the largest manufacturing city in England! Non-Birmingham readers may be tempted to call it an incongruity of beauty, but I can truthfully assure them that in this particular instance such a criticism would be somewhat out of place. This view of Moseley Station is not an isolated fraction, carefully rescued from dismal surroundings, and held up to the admiring gaze like a park in the slums. As it happens there is a very fortunate setting *outside* the station, but as the photo does not include this, it fails to do justice to the subject. The tunnel shown in the view is a short one—a little over a hundred yards in length—and is crowned by a small plantation, whose foliage completely hides the station during the greater part of the year. I might add that since this station was built, the town has extended so much that Moseley is now a long way from the country. A mile further south we come to the flourishing township of Kings Heath, with a population of 20,000, and that in its turn has pushed the open country still further out. Seeing that in the midst of all these changes Moseley Station has maintained its attractiveness in such a natural condition, I venture to regard the circumstance as distinctly out of the common."

* * *

Acetylene Lighting for Railway Carriages.

SEVERAL small railways use acetylene for illuminating railway carriages, but on the County Donegal Joint Committee's system acetylene is used systematically therefor, and the following particulars are kindly supplied by Mr. H. Forbes, Traffic Superintendent:—The County Donegal Railways, after lengthened tests, decided some four years ago to adopt acetylene gas as an illuminant for their carriages, replacing colza oil, which had up to that time been employed. The system adopted is the "Rosslee" patent, each coach being independently lighted. The equipment consists of a wrought iron tank fitted outside the end of the carriages, and encased in wood as a protection against frost. This tank is partly filled with water, and in it is placed a generator (removable) containing the required charge of carbide. The gas is generated by the turning of a tap, allowing the water in the tank to percolate to the charge. As generated, the gas passes through a pipe to a small purifier fitted to the end of the carriage, and thence by roof piping direct to the lamps. At the end of each journey the generator is removed from the tank to the lamp room, the lid unscrewed, and the spent carbide taken out. The residuum, it may be mentioned, is used to lime wash cattle pens, wagons, etc., and is also used in making

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mortar. Any unused carbide is replaced in the generator, and a quantity of fresh carbide added if required, the lid re-screwed, and the generator replaced in the tank. The apparatus is then ready for use. The whole arrangements are simple and satisfactory; there are no complications requiring skilled attention, and an intelligent porter can do all that is required. A supply of charged generators are kept at certain stations on the line, and in the event of a failure in a running vehicle the defective generator can be removed and replaced in a few minutes. There is no storage of gas, a supply being generated only as required. It has been found in practice that 4 lbs. carbide will light a six compartment coach for four hours, and at the present price of carbide, this works out about a farthing per hour per light. To this must be added an amount for the removal of burners, but this is a small item, and with care a burner will last for a season's lighting.

* * *

The Federated Malay States Railways.

We are indebted to a reader resident in the Malayan States for several newspaper cuttings and other enclosures giving particulars concerning the Federated States Railways, and, incidentally, expressing strong disapproval of certain phases of State management as there exemplified. That the distances involved are considerable is shown by a table of progressive mileages prepared by our correspondent. The main line extends from Johore Bharu, connected by a steam ferry (the construction of a bridge is proposed) with the Singapore lines, to Gencas, where a branch is put off northwards to Kuala Tembiling, thence to Tampin (short branch to Malacca Town), Seremban (branch to Port Dickson), and Kuala Lumpur, where the works and chief depôts are located. Here there is a southward branch to Port Swettenham and a short northward line to Batu Caves. The main line continues westward to Tapah Road (branch to Teluk Anson), Ipoh (branch to Tronoh), Taiping (branch to Port Weld), thence to the terminus at Prai, connected by a steam ferry with Penang. From Johore Bharu to Prai is 473 miles. There are several extensions proposed. In certain districts road motor services are operated. Fares per mile work out in English equivalents at 1.4d. first class, 0.84d. second class, and 0.56d. third class, taking the currency dollar at 2s. 4d. The railway is all single track, with loops at stations. In some cases the stationmasters are either Chinese or Jaffna Tamils.

Apropos of the alleged shortcomings of Government administration, our correspondent refers to the serious shortage of wagons, in consequence of which goods imported "sometimes take almost as long in transit up-country from the port of unloading as they did on their voyage from Europe or elsewhere." Happenings due to engine failures and derailments are also referred to in enclosed newspaper cuttings, which do not suggest that difficulties are dealt with with notable effectiveness or intelligence. Possibly, however, the fact that natives are employed in many cases renders it inadvisable to allow them to act at discretion, so that action is only allowed with definite instructions from headquarters, whereas under similar conditions at home it would be quite safe and satisfactory to permit stationmasters and officials nearer the scene of the trouble to act more or less on their own responsibility.

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The Colour Line.

Two letters have recently appeared in a South African contemporary, complaining that at some refreshment stalls on the South African railways, coloured natives were permitted to make use of the same drinking utensils as white people. The following editorial comment on the correspondence has been published:—

"We do not think the practice is in any way general, but its absolute prohibition throughout the railway system is not so simple a matter as some people may suppose. At first glance it may seem an easy thing to arrange that Europeans shall be supplied with china or earthenware cups and saucers and natives with enamel mugs. Unfortunately, those who have more than a superficial knowledge of the subject realise that the question is by no means so easy of solution as it appears. In pre-Union days the catering department of the Cape Government railways provided each coffee stall on the line with a stock of enamel mugs for the use of native customers. These utensils had no sooner been put into circulation than the better dressed and educated natives promptly raised the question of 'equal rights,' pointing out that what was sauce for the white gander was also sauce for the black goose. This matter of drinking utensils is by no means the only difficulty connected with the catering for native passengers which arises on the S.A.R. For instance, not long ago, a well-educated native holding a position of considerable prominence at the Cape, was travelling by train in the Transvaal, and requested a member of the catering staff to supply him with intoxicating liquor. The request was refused, and the passenger, annoyed at the refusal, reported the official. Had the latter supplied the liquor he would, however, have rendered himself liable to six months' imprisonment with hard labour, without the option of a fine. This would apply in any portion of the Transvaal or Free State, but had the train been running within the borders of the Cape Province the native passenger referred to would, as a registered voter, have been entitled to the supply of any intoxicating liquor he required. The bringing about of the Union did not, as some people seem to suppose, bring about uniformity of laws in the four Provinces, and so far as the enactments relating to native questions are concerned there does not seem much probability of uniformity being attained in the near future. The case we have quoted will serve, however, to show the difficulties with which the problem bristles under existing circumstances."

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South American Railways.

References to railway progress in South America are so frequent that it will be interesting to consider what is the position at this time in regard to railway construction and development. In the Argentine Republic over 20,000 miles of railway are in operation; yet the demand for extension is incessant, and large sums are being spent in the endeavour to satisfy it. It was in 1857 that Argentina obtained its first railways—a line 13 miles long from Buenos Ayres, built

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NEW YORK, NEW HAVEN AND HARTFORD RAILWAY LOCOMOTIVE, NO. 1346.
Built by the American Locomotive Company, New York.

on the 5 ft. 6 in. gauge in order to utilise rolling stock sent from Russia after the Crimean War. Of the present mileage about 16,000 belong to private companies and about 4,300 State-owned. The capital for the private lines has been largely raised abroad, close upon £200,000,000 being represented by the English companies. Railway development in Brazil began in 1854, with a rack and adhesion line from Maua to Petropolis. The railway from Rio to Queimados was opened in 1858. There are now 64 lines in the republic, aggregating about 14,000 miles. Chili has the Longitudinal Railway of over 2,000 miles, with about 20 other roads, giving a total of about 4,000 miles. In Peru the Oroya railway attains an altitude of 15,665 ft. above sea level, and nearly 2,000 miles of line are in operation. Uruguay has about 2,000 miles, Paraguay 300 miles, Bolivia has completed about 800 miles in ten years.

As regards other lines, we may quote from our contemporary *The Financier*, to whom we are partly indebted for some of the facts stated:—"Colombia has not been conspicuous as a railway builder, though it boasts nine different companies operating fifteen lines, most of them comparatively short. Both Venezuela and Ecuador, like Colombia, are very lightly supplied with railroads, the topography of the country militating against their construction, except at considerable expense. But in Paraguay railway development has been progressive, especially of late. Not only has communication been established with Buenos Ayres, but by means of the Paraguay North Eastern, to be finished in 1915, the country will be provided with an outlet for its produce *viâ* San Paulo, Brazil."

"Another link with Brazil will be furnished by the Trans-Paraguay Railway, which will link up with the road now being constructed westward from the Port of San Francisco. Inter-State lines are now comparatively common in South America. Buenos Ayres is now in direct communication with Valparaiso over the Transandine route. It is also possible to travel from the Argentine capital to Asuncion, in Paraguay, and ultimately it will be possible to proceed from that point either to the Brazilian port of San Francisco or to San Paulo and thence to Santos or Rio. Early this year, moreover, railway communication between Monte Video and Rio de Janeiro was established when the Uruguayan and the Brazilian roads were linked up at Rivera. On the other side of the continent Chile has been connected with Bolivia, while the latter Republic will soon be in railroad communication with Peru. From Peru a line practically parallel to the coast is under construction, which will ultimately pass through Ecuador and Colombia into the Isthmus of Panama. Eventually, no doubt, the great project of a Pan-American railroad will be realised, and it will be possible to proceed by railway from the southernmost part of the South American continent to the isthmus of Panama and beyond. Meanwhile the various links in the chain are being constructed, to the great advantage of the various regions through which they pass."

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The World's Railways.

We are indebted to a German publication—*Archiv für Eisenbahnwesen*—for a series of singularly complete and illuminative tables of railway mileage in all parts of the world. The figures apply to the end of 1911, that being the latest date for which all the required data is available. According to continents the position is:

	Miles.
Europe	210,574
America	336,185
Asia	65,252
Africa	25,159
Australasia	20,133
Total	657,303

In Europe, Germany has the highest total, with 38,485 miles, of which Prussia contributes 23,646 miles. Russia in Europe (including Finland) nearly reaches 38,000 miles. France is next with 31,213 miles, and then come Austria, Hungary, Bosnia and Herzegovina, providing an aggregate of 27,850 miles. Great Britain and Ireland follow with 23,394 miles, after which comes Italy with 10,705 miles. Four figure totals are headed by Spain (9,381 miles) and Sweden (8,758 miles). Belgium is next with 5,381 miles, followed by Switzerland (2,970 miles), Denmark (2,343 miles), Roumania (2,241 miles), the Netherlands (1,984 miles), Norway (1,921 miles), Portugal (1,853 miles), Bulgaria (1,208 miles), with other countries reckoning their railways only by hundreds of miles.

In proportion to area Belgium is most liberally provided with railways (47·2 miles per 100 square miles), followed by Luxembourg and then by the United Kingdom (19·3 miles per 100 square miles), descending to a meagre 1·4 for Turkey in Europe. In proportion to inhabitants Sweden

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heads the list with 16 miles per 10,000 people, followed by Luxembourg, giving 13 miles per 10,000 of its total of 246,000 inhabitants. France, Switzerland, Belgium, Norway and Denmark are all liberally provided on this basis, giving proportions of from 8·9 to 7·3 miles per 10,000 inhabitants, but Germany and Austria are not much above the United Kingdom (5·2 miles per 10,000 population). Turkey is again at the bottom, with 1·6 miles per 10,000. Taking Europe as a whole, there are 5·6 miles per 100 square miles of area and 4·8 miles per 10,000 inhabitants.

In America the United States are far ahead of any other national total, aggregating 246,601 miles for 3,592,930 square miles and 92,037,000 inhabitants, giving proportions of 6·9 per 100 square miles and 26·8 per 10,000 population. Canada comes next with 25,395 miles—0·8 per 100 square miles, and 39·1 miles per 10,000 inhabitants. The last figure is exceeded by 40·1 miles per 10,000 population in the case of the Argentine Republic, though there the mileage per 100 square miles is actually only 1·8. In Asia, British India is a long way ahead with 32,832 miles, though this only gives area and population averages of 1·6 and 1·7 on the basis above set forth. The next highest are Siberia and Manchuria, China and Japan, each with over 6,000 miles. At the bottom is Persia with 33·6 miles, giving area and population averages of 0·005 and 0·04 miles respectively. None of the African totals call for more than four figures, though the South African Union very nearly reaches 10,000, and has probably exceeded that mileage by this time. Then come Algiers and Tunis, and Egypt, with the Italian Colonies giving the lowest total of 73·9 miles. In Australasia all the colonies except Tasmania are well up in the thousands, ranging from 4,028 miles in Queensland to 2,115 miles in South Australia. Hawaii and other islands add together 88 miles. It is worthy of notice that although West Australia has no less than 64·6 miles of railway per 10,000 inhabitants, it provides a meagre 0·32 miles per 100 square miles. On the basis of area, Victoria is highest with 4 miles of line per 100 square miles, giving 27·7 miles per 10,000 population.

* * *

State Railway Mileage.

Quoting from the same source, we reproduce figures relating to the world's State-owned railways. The total and State mileages in the respective Continents are:

	Total.	State.
Europe.. ..	210,574 ..	109,718
America ..	336,185 ..	12,409
Asia	65,252 ..	42,451
Africa	25,159 ..	16,450
Australasia ..	20,133 ..	18,217

It will be seen that by far the larger proportion of the Australasian railways is in the hands of the State (almost all British, by the way), while Imperial interests in Asia and Africa go far to create the large State-owned proportions in Asia and Africa. America provides the converse, though even there the Government lines in Canada account for 1,719 miles, all other State Railways being in South or Central America. In Europe, Germany is the biggest factor as regards State ownership, 35,065 miles out of a total of 38,485 miles. Apart from the United Kingdom, the only European countries where there are no State railways worth speaking of are Spain, Greece, and Turkey. There are, however, several countries where the proportion is less than half of the total mileage, as in France (only 5,530 miles out of 31,213), Belgium (private and State lines substantially equal), Luxembourg, Portugal, and Sweden. It will be useful to set forth the State railway mileages as far as the British Empire is concerned:

	Miles.
Canada	1,719
British India	28,768
Cape Colony	3,318
Natal	1,093
Central South Africa ..	2,589
Rhodesia	1,392
Other African Colonies ..	1,314
New Zealand	2,752
Victoria	3,490
New South Wales	3,642
South Australia	2,057
Queensland	3,660
Tasmania	469
West Australia	2,144
Total	58,407

While all these lines may correctly be described as State-owned, the basis of control and administration varies considerably; but whatever influence such factors may have upon the situation, the fact remains that the British Empire includes 58,407 miles of Government railway out of a world's total of 199,246 miles, and exceeds that of any European power, Germany included, even when the German Colonies in Africa are added to the home mileage.

* * *

Fog Signalling Machines.

Although the accident which occurred on August 29 near Tottenham Hale, on the Great Eastern Railway, was not in itself serious, Lieut.-Col. von Donop's report to the Board of Trade in reference thereto is of peculiar interest in that the evidence is so closely concerned with the Clayton fog-signalling machines in use in the district. The report is, indeed, in refreshing contrast to so many accident reports which have recently come under notice, in that the amplitude and sufficiency of the protective devices provided is well shown; no one is seriously blamed, except the driver of the colliding train, who is censured for "want of care," and even he is treated very leniently, as he appears to have lost his bearings in the fog, and to have acted reasonably when he realised that he had passed signals without seeing them; and the only recommendation offered is that another fog-signalling machine should be installed. The peculiar feature is that no one seems to have heard the detonators explode, though the evidence is fairly conclusive that they did go off. This is explained by the fact that some of the witnesses were hardly near enough to have heard them, while it is thought that the driver and fireman, having lost their bearings, if they heard them at all, accepted them as warnings of approaching signals for which they were prepared.

* * *

The Development of Cliftonville, Margate.

In recent years the expansion of Cliftonville, the more fashionable portion of the borough of

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Margate, has been so great that further railway accommodation has become essential, and arrangements have now been concluded for the erection of a large station to which many of the fast trains from London will run without stop. The landowners have welcomed the proposal, and the Corporation will make a road giving excellent access to the new station, which will be conveniently situate, in the centre of Cliftonville. At the other end of the town, Westbrook is also making rapid strides, and this year the entire borough has enjoyed unparalleled success, its holiday attractions being no longer confined to the summer months.

* * *

Safety Inventions for Railways.

EXAMINATION of the patent records following any serious railway accident indicates that inventors all over the country have been encouraged to scheme out ideas whereby railway travelling may be robbed of what little risk to life and limb still remains. Many of these ideas are absolutely worthless, and very few even of those that are acceptable include any appreciable proportion of novelty. Indeed, in numerous cases it is plain that the inventors do not appreciate the real facts of railway operation and equipment, their ideas being based upon supposed conditions which do not exist There is, however, good ground for the claim advanced by the *Crewe Chronicle* that the suggestions of practical men and particularly of engine drivers are worthy of special consideration. None know better the difficulties of managing trains in all winds and weather, and it must be remembered also that they know well they are the first to suffer in the case of any casualty. It is this which gives their opinions on the subject added weight and importance.

* * *

The Control System and Emergency Conditions.

ALTHOUGH Lt.-Col. Druitt's report to the Board of Trade in reference to the collision between two goods trains which occurred at Accrington, Lancashire and Yorkshire Railway, on July 17, is of interest in that it reveals some of the difficulties incidental to working traffic in this district, it is particularly noteworthy in that the fact that the control system was in operation over the area involved enabled other traffic to be dealt with in a singularly effective manner. A goods train had to descend the Baxenden bank, varying in steepness from 1 in 104 to 1 in 38; and owing to its being allowed to pass on to the gradient—for which the driver gave a good reason—before brakes were pinned down, the train ran away, leaving the rails and colliding with another goods train at Accrington station. The driver in helping the fireman to pin down brakes was left behind, but after running after his engine, managed to clamber on to one of the wagons, though he could not get to the engine in time for effective action. Driver Simpson's error was rather one of judgment than a subject for condemnation, and it is acknowledged that the location is a particularly difficult one to work.

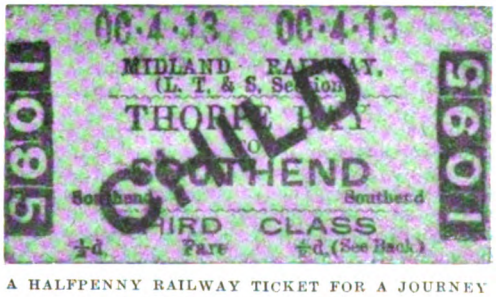
At Accrington all lines were blocked, both those through the station in the direction of Burnley and also the fork lines leading towards Blackburn. The accident occurred at about 2.8 a.m., and at 2.15 a.m. the controllers at Manchester were in receipt of full information and took immediate steps to divert the traffic. Twelve goods trains were either diverted or broken up that would normally have passed through Accrington in the early hours of the morning, and arrangements were made to work a shuttle service for passenger trains between Ramsbottom and Accrington bay siding, the controllers demanding the engine and carriages for the purpose. Telegrams were sent to the principal stations advising them of delay to trains and to inform passengers, but owing to the diversion of the trains the delay to the passenger service was not serious, down trains arriving at Accrington about 21 minutes late, and up trains 25 minutes late.

Incidentally, it is a matter of interest to note that on this incline banking engines are frequently used to *assist* descending trains. This is, of course, for purposes of control and to provide additional braking power on the steep grades.

* * *

Halfpenny Fares.

A READER directs attention to a standard railway fare where the charge is only one halfpenny, although the distance covered is more than two miles. For the benefit of those interested in railway ticket curiosities we illustrate a ticket for this journey. The ordinary fare for an adult is one penny, notwithstanding the long distance separating the two stations, so that the fare for a child is one halfpenny, and as the practice of cutting a ticket in half for such use is not now adopted on this section, it follows that halfpenny tickets have to be provided. There are probably many other half-fare tickets for the same amount, but it is doubtful whether an instance can be quoted where a longer distance is covered, tickets being specially printed therefor.



A HALFPENNY RAILWAY TICKET FOR A JOURNEY OF MORE THAN TWO MILES.

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THE report of the trustees of the Railwaymens' Convalescent Homes at Herne Bay and Leasowe Castle, Cheshire, states that the year 1912 was one of useful and encouraging effort. A pleasing feature was the increase in the small regular contribution of about a half-penny per week, evidenced by the returns from the older subscribing lines. As far as the younger contributing companies are concerned, profiting by the experience which the promoters acquired in the ordinary effluxion of time, they have found it possible and best to commence operations with a definite understanding on this important matter. The total patients from June, 1901, was increased during last year to nearly 17,000 men, by the reception of 1,846 at Herne Bay and 568 at Leasowe Castle. In other words, an average of very nearly 8 of the sick and injured of the railway service were received by these homes on every week-day through the year; as against an average of more than 5 for the years 1906-1911. These figures serve to show the scope of the work and by comparison prove that the homes are doing more for the sick and injured of the railway service and their dependants than any similar institutions in the United Kingdom and Ireland. A very large percentage of the income is made up from the voluntary personal contributions of the subordinate staff. The committee have been much encouraged during the year by the addition to the patrons of Her Majesty the Queen, Her Majesty Queen Alexandra, and Her Royal Highness the Princess Louise; and they record with a deep sense of gratitude the visit of the latter, and of the Duke of Argyll, to the concert at the Royal Albert Hall on the 28th November. It was a compliment which would have lasting effects and always be gratefully remembered. Regarding the concert, the trustees take this opportunity of expressing their thanks to the proprietary seat holders for their kindness in permitting the concert committee to have their seats for the evening. The homes continue to enjoy the sympathy and assistance of the chairmen, directors, and officers of the railway companies. The one great disappointment of the year was the abandonment of the usual public dinner, at which they were to have had the late President, the Earl of Bessborough, in the chair. His lordship felt that they could not go on in the face of the misery and uncertainty resulting from the lamentable coal strike, and his friends were deprived of the pleasure, to which they had looked forward, of supporting his appeal in person. Despite this, Lord Bessborough yet found it possible to add a material sum to the homes' funds. The desire, evidenced in so many directions, to honour the memory of the late Chairman, John Edward Nichols, found expression in the provision of handsome memorial tablets, both for Herne Bay and Leasowe Castle, as well as a silver shield for ambulance work which was to be open for competition on all railways in Great Britain. As a successor to Mr. Nichols, his colleagues have elected Mr. John Marks, of the South Eastern and Chatham Railway Company. Mr. Marks has long been connected with the homes, and joined the late Mr. William Thomas Culver, when that gentleman was chairman, in the early organising work on the South Eastern Railway. Enjoying the confidence of his brother trustees and committeemen, and possessing the respect of the staff of the South Eastern and Chatham Railway Company, it is expected that Mr. Marks will conduct the meetings of the Homes' Committee in a way at once efficient and satisfactory. Leasowe Castle is proving its worth to its present owners. It certainly offers the fullest opportunity for the renewal of good health, and as it becomes better known to the men in the South, doubtless a larger percentage of them will find their way to Cheshire. Thanks are heartily offered to Messrs. W. B. Peat & Co., honorary auditors; Mr. H. H. Groves, honorary solicitor; and to the medical officers, Dr. T. Armstrong Bowes, of Herne Bay, and Drs. Thacker King and Hardy Fleetwood, of West Kirby, each of whom have some share in the satisfactory results which have blessed the effort put forth. Mr. W. R. R. Culver is the secretary of the homes, and contributions in aid of their excellent work may be sent to him at 116, Victoria Street, Westminster.

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IN his Presidential address to the Engineering Section of the British Association, Professor Gisbert Kapp effectively summarised the present situation in regard to main line railway electrification. Incidentally, he referred to the fact that both electrical and steam engineers are liable to be biased, albeit unconsciously, in favour of their early training and experience: Most engineers, he said, loved their profession and were enthusiasts; being enthusiasts they were biased. This applied as well to the electrical engineer as to the mechanical engineer—perhaps to the electrical engineer most. In many cases he was so biased that he would not admit any virtue in any other but his own pet scheme of electric traction. A modern steam locomotive was a beautiful and efficient engine, and one could well understand its designer looking at it with the pride of a father whose son had turned out a good man. One could also understand that the steam engineer would not readily admit the superiority of an electric locomotive. The

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mental horizon of everyone must necessarily be narrowed by previous training and professional enthusiasm; let them, then, said Professor Kapp, try to forget for a moment that they were engineers, put out of their minds all questions of mechanical or electrical detail, and focus their thoughts merely on what was going on all around them as regards electrification of railways. Professor Kapp dealt in detail with various methods of electric traction suited to main railway operation, and discussed their difficulties, merits and demerits from the point of view of the electrical engineer, and in reference to the practical aspects which govern their adoption or not. There is no need to refer to these matters further, but in introduction he gave a succinct and singularly interesting summary of the present position, which may advantageously be quoted: "Year by year more lines were being electrified. Some were failures; but the very fact that in spite of these failures the process of electrification was going on showed that the failures were remediable. In some cases it was easy to understand why a line should be electrified. If fuel was dear, if the trains must be heavy and frequent, if there were steep grades and long tunnels, then obviously steam was at a disadvantage and electricity could beat it easily. But electrification was not limited to cases where there were such obvious advantages. A military State like Prussia was seen electrifying a fairly long line where the traffic was not extremely heavy, where there were very gentle gradients, and only few and short tunnels. Moreover, one of the stock arguments against electrification was that in case of war the whole system might be broken down by the enemy cutting the wires; yet this consideration, if it had any weight, did not deter a military State from at least experimenting with electric traction on a large scale. Suburban lines were growing longer and longer, until they might almost be classed as short main lines, and the Swiss Government was buying up water powers with the object of utilising these powers in the electrification of its most important main lines. In America the electrification of large systems was taking place, not only for passenger service, but also for goods service, comprising trains of 2,000 and more tons weight, and goods yards to the complete exclusion of steam. A man need not be an engineer to appreciate the significance of such a general development. No Government department, and certainly no board of railway directors, would spend money merely for the sake of an interesting scientific experiment, and, although it was conceivable that in an isolated case such an experiment might be undertaken under a miscalculation as to its possible success, it was not conceivable that such a miscalculation should be the general rule. In all countries a vast amount of labour was devoted to and capital spent on the electrification of main lines, and the conclusion was inevitable that this new application of electricity was bound to progress."

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"THE National Society of Free Workers, Limited," is the title of a new association in which railway employés are largely concerned. The Society is the outcome of a national conference held in Bradford, September, 1912. It has been formed to deal with the conditions created by recent developments in the industrial world and in the railway service. A second national conference took place at Birmingham, on October 17th and 18th. The objects of the Society are (1) To provide members (or in cases of death their legal representatives) with legal assistance in cases connected with their employment, *i.e.*, cases of (*a*) molestation; (*b*) accident; or (*c*) any illegal treatment. (2) To protect by every means in its power the right of individual members to live and work in freedom so long as they do nothing to interfere with the enjoyment of a like freedom by all others. (3) Generally to maintain the principles of personal liberty and personal responsibility, and do all such other lawful things as may be incidental or conducive to the attainment of the above objects. The Society is divided into branches, each branch having an Orphan Fund and a Benevolent Fund supported by the voluntary subscriptions of the members. The membership subscription is 6d. per quarter, and the subscription to the Orphan Fund is 6d. per quarter, and to the Benevolent Fund, 3d. per quarter; so that for all benefits the total subscription is 5s. per annum. The registered address of the Society is at 7, Pall Mall, S.W.

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AT the meeting of the British Association for the Advancement of Science, on September 17, a paper on the re-construction of Birmingham Snow Hill station was read by Mr. F. Gleadow, M.Inst.C.E., bridge and ironwork assistant to the Great Western Railway Engineer, and Mr. C. E. Shackle, A.M.Inst.C.E., resident engineer. Sir Oliver Lodge, the President, said that while he could not hope to contribute anything to the discussion from an engineering point of view, he felt bound to say that this work was a local feat of engineering of which Birmingham citizens had reason to be proud. Snow Hill station a few years ago was rather mediæval, but now it was a very admirable station. The work had been executed without any dislocation of traffic, though it must sometimes have been conducted under extraordinary difficulties.

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A NEAT souvenir has been supplied to members of the Institution of Locomotive Engineers who were privileged recently to visit the Derby Works of the Midland Railway, on the invitation of the President, Mr. Henry Fowler. The title page conveys the information that the Midland Railway Company of England was formed in 1844 by the amalgamation of the North Midland, Midland Counties, and Birmingham and Derby Junction Railways. The total mileage open is now 1,582½. Other pages include photographic reproductions of compound locomotive No. 1025, rebuilt superheater engine No. 483 (a coloured plate of this engine is presented with this number of the RAILWAY MAGAZINE), the well-known tombstone memorials to railwaymen interred in Bromsgrove Churchyard, and views in the erecting and machine shops at Derby At the opening meeting of the Institution, held at Caxton Hall, Westminster, on Friday, October 3, Mr. G. F. Burtt read his paper on "Some French Railway Services and Locomotive Performances." This was followed with interest, although it was mainly confined to the Northern, Paris-Orleans and P.L.M. Railways

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(the others being reserved for a further contribution), and gave rise to animated discussion. The second portion of Mr. W.J. Bennett's paper on "Locomotive Boiler Examination, Defects and Repairs" is arranged for November 1st., also at Caxton Hall.

* * *

THE fourth Exhibition of Engineering Models, arranged by the Manchester Society of Model Engineers, will be held at the Manchester Coal Exchange, Market Place, on November 6 and 8. In addition to an interesting collection of exhibits prizes will be awarded under the following headings:—(1) For any model showing the best example of engineering workmanship and finish; (2) for the best model designed and built entirely by the competitor; (3) for the best model speed boat; (4) for the most realistic model steamer; (5) for the best model locomotive; (6) for the most successful working exhibit. Entries for these competitions closed on October 1. The secretary is Mr. Basil H. Reynolds, 35, Torbay Road, Chorlton-cum-Hardy. The exhibition will be opened by the Lord Mayor of Manchester. There will be several good models of locomotives exhibited, chiefly of about 2½ in. gauge; among them being Mr. Aynsworth Harrison's model G.C.R. "Atlantic," a 4-4-2 tank by Mr. S. L. Thompstone, of Manchester, a 4-6-0 C.R. *Cardean* by Mr. Wilkens, of Sale, and a 4-6-2 tank by Mr. W. H. Jubb, of Sheffield. Special interest attaches to the inclusion of a portion of Mr. L. H. A. Carr's 1¾ in. gauge model railway. This is thought to be the smallest model railway which is block signalled throughout, and, in fact, is probably the only amateur model railway that is completely equipped with block telegraph instruments. A photograph is reproduced showing one of the signal cabins. The railway comprises four sections, but owing to difficulties of carriage, etc., the exhibit will only include an oval (double) track divided into two block sections. The two signal boxes which control it are both interlocked, and fitted with their four block instruments, and block working will be shown during the exhibition. All the signalling apparatus has been made by Mr. Carr, and owing to the smallness of the railway, portions of it appear somewhat crude, but this is partly a necessity of the scale. For example, to make a telegraph dial, or a set of tappet interlocking gear, and to *work*, on a scale of 1/32 full size is verging on the impossible. As a matter of fact, the instruments are made of pillboxes, one inch in diameter, which contain the coil, the needle, ¾ in. long, being of course outside. Scale operating gear is not attempted, button-type keys (of the G.W.R. pattern) being fixed below the shelf on which the railway runs.

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THE fourth exhibition of models, tools, and scientific apparatus, organised by the proprietors of *The Model Engineer*, was held at the Royal Horticultural Hall, Westminster, in October. A splendid series of engineering models from all parts of the kingdom were entered for the various competitions, and many interesting exhibits were shown in the loan section. Special rooms were devoted to wireless telegraphy in operation, and to aeroplane models, while a completely equipped workshop run by members of the London Society of Model and Experimental Engineers, gave demonstrations of model making and workshop operations. The principal model yachting and power boat clubs of London exhibited their latest craft, this section including the team of English boats which recently won the International Championship at Paris. Other features, such as scientific experiments demonstrated by Mr. V. E. Johnson, M.A., working models, an 80 ft. miniature railway with steam and electric locomotives running, helped to render the exhibition attractive as well as instructive.

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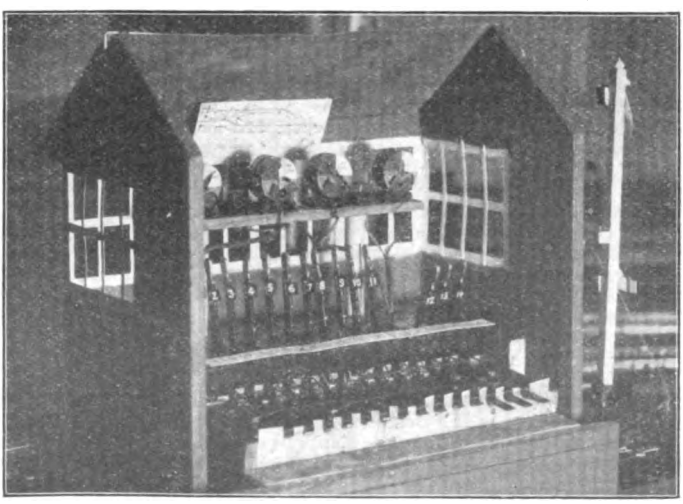
THE President, Rev. W. J. Scott, was the speaker at the meeting of the Railway Club held on Tuesday, October 14th, his subject being the history of the Great Central Railway, late Manchester, Sheffield and Lincolnshire Railway. He reviewed many phases of development and policy as shown by the history of the 'sixties, 'seventies and 'eighties; but was obliged to defer a portion of his lecture until another occasion, so much time having been occupied in considering the earlier and eventful periods. Mr. A. W. Bartlett is announced for a paper on the Somerset and Dorset Railway on Tuesday, November 11th. On December 9, Mr. H. L. Hopwood will describe a series of lantern views, and the Annual Dinner is arranged for Friday, December 12, at the Holborn Restaurant.



MR. CARR'S SIGNAL CABIN FOR OPERATING HIS MODEL RAILWAY ON THE BLOCK SYSTEM.

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A FEATURE of the syllabus of the Choumert Road Commercial Institute (London County Council), Rye Lane, Peckham, is the inclusion of classes for railway clerks and officials. The lecturers are Mr. Baker Welford,

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Mr. L. Jones and Mr. L. Green, M.A., the classes being held on Wednesday and Thursday evenings (7.15–9.45). The subjects covered are: (1) "The Law of Carriage by Railway"; *Goods*—obligations, facilities, delivery, empties, bye-laws, contracts, rights, animals, luggage, recovery, risks; and *Persons*—responsibility, negligence, offences; (2) "Railway Accounts and Finance"; (3) "Railway Economics and Statistics"; (4) "Railway Geography"; and (5) "General Geography."

* * *

AN inaugural reunion of officials of the canvassing staff of railways having termini in London was held at Felixstowe at the end of September. The outward journey was made by the 11.40 a.m. train from Liverpool Street. A reserved dining car was provided by Mr. F. G. Randall, Superintendent of the Line, and luncheon served *en route*. At Ipswich, the party embarked in the Great Eastern Company's steamer *Suffolk*, on which an enjoyable trip was made down the river Orwell to Harwich, and thence to Felixstowe, whence after a few hours spent at that delightful resort, the return journey to London was made by train. On the up journey Mr. Turner (Midland) proposed a hearty vote of thanks to Mr. Henry Smith for having initiated the outing, and for the excellent manner in which all the arrangements had been carried out. This vote was cordially passed, and thanks were also accorded to all the officials who had assisted to make the journey a success. Mr. Potts (office of the Superintendent of the Line, Great Eastern Railway) has undertaken the duties of hon. secretary for next year. Among those present were Messrs. Potts, Perry, Hasler and H. Smith, Great Eastern Railway; Messrs. Hill, Whiteley, Bird, Overend, Tyler, Williams, Gibbons and Bird, London and North Western; Messrs. Carter, Keppie, Major, Ayre, Barksbey, Watson, Turner, Lempriere, Smith, Groves, Reeves and Cope, Midland Railway; Messrs. Gibbs and Pike, Great Western Railway; Mr. Housego, Great Northern Railway; Messrs. Wheeler and Lang, London and South Western Railway; Mr. Shaw, Lancashire and Yorkshire Railway; and Mr. Harrison, London, Brighton and South Coast Railway.

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THE winter programme of the classes and lecture and debating societies on the Great Western Railway is very comprehensive. Classes have been commenced at numerous centres for all grades of men, at which first-aid knowledge and practice will be acquired. Arrangements provide for an opening address to the London Lecture and Debating Society by Mr. F. Potter, the General Manager, the session at Bristol being opened by the Rev. W. J. Scott with a lecture on "Our Neighbours and Competitors." Classes on Station Accountancy have been arranged at Paddington, with signalling classes as usual at various centres, the latter being amplified by correspondence courses, qualifying for subsequent examination, to meet the requirements of those not able to attend the classes owing to distance and duties. The company are continuing to provide facilities for a number of students to attend the London School of Economics and Political Science (University of London), where the curriculum includes railway and cognate subjects and leads up to a university degree.

* * *

THE annual ambulance competition open to Great Central Railway teams for the cup presented by Mr. C. W. Bartholomew was held in the grounds of Blakesley Hall, near Towcester. Fifteen teams competed, from Annesley, Dunford, Dukinfield, Gorton, Immingham Dock, Leicester, Lincoln, Liverpool, Neasden Loco., Neasden Traffic, Nottingham, Staveley, Tuxford, Wath, and Woodford. The judges were the Mayor of Northampton (Superintendent W. Harvey Reeves) and Sergeant-Major Mackness (stretcher work), Dr. R. A. Milligan, J.P., and Dr. Glen Hays (individual work). Mr. J. Bartholomew presided over the luncheon in the absence of his father. The marks obtained by the respective teams were:—Wath 346, Gorton 298, Neasden Loco. 297, Woodford 274, Dukinfield 253½, Liverpool 251, Tuxford 249, Lincoln 246, Leicester 245½, Nottingham 237, Dunford 230, Annesley 221½, Staveley 180½, Immingham Docks 161, Neasden Traffic 154. Gorton were second for the third successive year.

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STEPS are being taken for the formation of a Great Eastern Railway Literary and Debating Society for the discussion of subjects of general interest to railway men of all grades. The subscription will be 1s. per annum and meetings will be held at the Mechanics' Institution, Stratford. Membership is open to all members of the G.E.R. staff. Those wishing to join should communicate with the honorary secretary (*pro tem*), Mr. F. M. Major, Audit Office, Liverpool Street. Offers of papers on, or the introduction of, debatable subjects are also invited.

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THE Metropolitan Railway Company now issue ladies' "limited" season tickets, at half the ordinary rates between any of their stations in the London area. These tickets are "limited" in the sense that they are not available until 10.30 a.m. on week-days, the primary object being, of course, to meet the convenience of ladies who wish to shop in town. With a view further to encourage the use of season tickets, these are issued on any day for any period from one month upwards, and all except the monthly tickets may be deposited with the Company for periods of a fortnight or more during the absence of holders on holiday, the full time of such deposit being added to the period for which the tickets are renewed.

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THE illustration of a picturesque tunnel mouth reproduced on page 295 of the October RAILWAY MAGAZINE, has produced a heavy correspondence. The tunnel in question is known either as "Halton," "Sutton," or "Norton." It is situated between Halton and Norton stations on the London and North Western and Great Western Railways joint line between Chester and Warrington, and its west end is just north of Sutton Weaver station, on the Runcorn line, which passes very nearly over the mouth. Its length is 1 mile 160 yards. A large number of

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readers have replied correctly. Among various suggestions, Box tunnel, Redhill tunnel (near Trent, Midland Railway), Midford tunnel (Somerset and Dorset Joint Railway), Folly tunnel (London and South Western Railway) may be mentioned.

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THE Great Eastern Railway Company have employed eight-coach bogie trains for some time, but they have been confined largely to the suburban services on the Loughton branch, owing to the necessity for varying the make-up of many trains to adapt them for specific journeys. For this purpose the bogie trains already in use include three or four variations in composition. Other trains have now been added, providing a larger proportion of third and second-class accommodation to suit the Fairlop and Ilford services. The new trains have a third brake and a third and second composite at each end, with a suitable arrangement of second and first class accommodation between.

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AT the end of the present year dead buffer stock will, in compliance with Board of Trade regulations, be taken off the market. As far as the South Wales district is concerned, it is estimated that about 10,000 wagons will be affected, one local railway company alone being reported to have about 3,000 of these wagons, which will be rendered unserviceable at the end of December.

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RESTAURANT cars are now run on the 12 noon train from Liverpool Street to Hunstanton, returning on the 4.36 p.m. train from Hunstanton to Liverpool Street. On Saturdays only, a train leaves Liverpool Street at 1 p.m. for Ipswich, Felixstowe, Lowestoft, Yarmouth, and Gorleston. Restaurant cars are provided on the Yarmouth section. On Saturdays only, a train leaves Liverpool Street at 1.30 p.m. for Colchester, Clacton, Walton, Ipswich, Norwich, Mundesley, Sheringham, and Cromer. A train leaves Harwich at 3.12 p.m. for Ipswich, affording improved connections to Bury St. Edmund's, Newmarket, Cambridge, the North and Midlands. The 8.33 p.m. Sunday train from Liverpool Street to Ipswich will continue to run throughout the winter; and the 8.43 p.m. Sunday train from Liverpool to Ipswich will call at Ilford to take up passengers.

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THE new frontage recently opened in the courtyard of Broad Street Station completes the work associated with the Central London Railway extension to Liverpool Street. A temporary street entrance provided in the front of the North London Station has hitherto sufficed for street access to the "tube" station. The new frontage has been constructed under the supervision of the London and North Western Railway Company. It surrounds the courtyard staircases which have long constituted a feature of Broad Street Station. Portland stone is used, and the design is particularly neat and symmetrical, with "tube" entrances on either side of the central opening. Accommodation is also provided for two shops, replacing the four which previously existed.

MR. J. G. ROBINSON, Chief Mechanical Engineer, Great Central Railway, has amplified the 4–4–0 locomotives in service by a series of new engines of the same class fitted with superheaters. There are to be ten in this order, numbered from 429 onwards. The heating surface is:

Tubes	1502	sq. ft.
Firebox	157	,,
Superheater	304	,,
Total heating surface.. ..	1963	,,
Grate area	26	,,

The cylinders are 20 in. diameter by 26 in. stroke, with Robinson patent outside admission piston valves, actuated by direct link motion. The coupled wheels are 6 ft. 9 in. in diameter. Weight of engine in working order is 61 tons; and of the tender in working order 48 tons 6 cwt.

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THE Corporation of Glasgow have appointed a special committee to consider and report as to possibilities of a system of electric "tube" railways from east to west (Shettleston to Clydebank) and from north to south (Bishopbriggs to Rouken Glen). Parallel street tramway routes are recommended for the same purposes, but these would retain all the traffic above ground and would not relieve congestion to any great extent. It is estimated that the scheme would cost about £10,000,000, but as the present cable subway barely pays its way grave doubts are entertained in some quarters regarding the proposal. On the other hand the suggested lines would tape a wider field and cater for traffic of a more comprehensive class than is provided for by the subway.

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IN order to meet the continued growth of traffic to and from Harrow-on-the-Hill, the Metropolitan Railway Company are now constructing a new station on the Harrow and Uxbridge branch. The station, which is to be known as West Harrow, will be situated on the Vaughan Road, about three-quarters of a mile on the Uxbridge side of the present Harrow-on-the-Hill station, and will serve a large residental district.

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THE North British Railway is now added to those lines which have introduced the control system of dealing with goods and mineral traffic. For the present the Lothian area only is involved, a splendid field for experimental introduction, but in due course it will be applied to the Fife coalfields and other suitable districts. Many of the engines of all classes already bear large numerals on the tender or tank sides, placed between the initial letters N.B. in order to enable the numbers to be easily observed as required in carrying out the control system.

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ALTERATIONS have already begun at Wimbledon station in connection with the extension of the Metropolitan District Railway to Sutton. The new line will pass on the north side of the station, and a tunnel will be required under the roadway and the houses on the opposite side of Hill Road. Alterations in view involve the construction of a station adjoining the All-England lawn tennis ground, stations at Merton, Morden, and other places before reaching Sutton, the number in the whole extension being probably seven. The new line will be 5¼ miles in length.

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A NEW wireless telegraph station has been erected on the top of the cliffs near the Harbour Village at Fishguard. The equipment of the station is capable of transmitting and receiving messages within a radius of 500 miles, the necessary power being obtained from the Great Western Railway Company's generating station at the Harbour. The turbine steamers, *St. David*, *St. Patrick*, and *St. Andrew*, engaged on the Irish cross-channel services, have also been equipped with wireless apparatus.

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IN order to encourage the building of houses as summer residences at the watering-places on their railway, the Cambrian Railways Company has arranged to issue a free pass on certain conditions to the head of a family who may build and occupy as his summer residence a house of not less than £50 annual value, the plans to be submitted and approved by the company's engineer. Particulars, including the extent of the free pass, can be obtained from the Secretary and General Manager, Cambrian Railways Company, Oswestry.

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THE Lancashire and Yorkshire Railway Company have issued their syllabus of Lantern Lectures for use during the coming season. The series comprises ten Lectures, which deal with the popular holiday and pleasure resorts in Lancashire and Yorkshire, Wales, Ireland, Isle of Man, Belgium, etc. Full particulars of the conditions of loan may be obtained from Mr. A. Watson, Superintendent of the Line, Victoria Station, Manchester.

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MR. JOHN WARDLE is the first holder of the position of "Commercial Manager" to the Metropolitan Railway Company, succeeding Mr. James Feiron, who has ably conducted the advertising and publicity departments for so long, but with a wider scope consequent upon reorganisation and in view of the increasing commercial and traffic importance of the Metropolitan Railway. The Commercial Department now inaugurated will deal with the Commercial side of the business of the Railway, including Advertising and Publicity, and all questions connected with the obtaining of new traffic, etc. Mr. Wardle spent eleven years on the Lancashire and Yorkshire Railway, passing through all departments in the Goods Manager's Office, eventually becoming, for four years, Secretary to the Goods Manager. During this period a comprehensive training, theoretical and practical, was obtained, the Lancashire and Yorkshire Railway providing an admirable field therefor. He was then appointed an assistant to the Secretary of the Grand Trunk Railway of Canada, and while holding this position he accompanied the President, Sir Charles Rivers Wilson, on an inspection tour through Canada and the United States. Naturally this experience was of immense value. On returning Mr. Wardle contributed a series of articles to the RAILWAY MAGAZINE, and these were afterwards published in book form under the title of "A Tour over the Pioneer Railway of Canada." Four years afterwards he was appointed London Manager of the Traffic Department of the Grand Trunk Railway; and at the end of 12 months became a partner in a Railway and Steamship business. In 1908 Mr. Wardle was offered, and accepted, the position to organise and take charge of the Parcels and Goods Department of the Metropolitan Railway, and this has now culminated in his appointment as Commercial Manager.

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MR. W. F. S. ALLISON, Assistant Locomotive Superintendent, Nigerian Railways, writes to correct two or three slight errors in Mr. Richard Arnold's article on "Travelling by Railway in Nigeria," published in our September issue. Engine No. 205 (not 203) takes the Boat Express for Minna to Jebba Island—a distance of 160 miles—and does not go through to Zungeru. No. 203, having an eight-wheeled double-bogie tender, works the train from Jebba South to Oshagbo—a distance of 120 miles—and not as stated in the article to Ilarin, 60 miles south of Jebba.

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THE early death of Mr. Herbert W. Garratt, M.I.Mech.E., F.I.I., is announced. He occupied various leading positions as a practical locomotive engineer at home and abroad, particularly in South America; but is best known as the inventor of the "Garratt" articulated locomotive. A number of remarkable engines of this class have been built by Messrs. Beyer, Peacock & Co., Ltd., who hold the patents. This design solved the problem of allowing full liberty of boiler and firebox dimensions in conjunction with the desired flexibility for use on narrow-gauge and light tracks. Among other engagements, Mr. Garratt was one of the early members of the Institution of Locomotive Engineers, and was a member of the council of that society.

MR. JOHN WARDLE,
Commercial Manager, Metropolitan Railway.

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It has long been realised that in neglecting May, June, and the early portion of July the pleasantest holiday weeks of the year are being wasted; but while present conditions and arrangements govern the situation it is almost hopeless to expect that there will be great changes in this respect. Family holidays are largely governed by school terms, and in many cases social, business, and other factors also help to restrict the annual seaside or country vacation to a certain specified period, with the result that for about seven or eight weeks every place is full, prices are high, trains crowded, and in other ways much of the advantage of the holiday is lost. There is, however, a decided movement on foot, by railway publicity departments and by development associations in coast and inland resorts, to induce people to take greater advantage of the long days and fine weather of May and June, when Nature is at its best, prices are lower, accommodation more generous, and trains less crowded; and they are pressing that convention should be relaxed and school holidays and other factors arranged on a more elastic basis. One proposal is that school holidays should commence at varying dates in different districts, or that the scholastic terms should be altered as follows: (1) January 15 to March 24, (2) April 7 to June 30, and (3) September 1 to December 15, giving intermediate holidays, respectively, of two, eight, and three weeks. Another proposal is that the principal resorts should inaugurate their summer arrangements earlier. The railways and other travel agencies are quite ready to co-operate as soon as there is justification, and in conjunction with the Health Resorts Advertising Bill, which will enable seaside and health resorts to levy up to a penny rate for advertising, it should be possible to exercise a strong influence in the way suggested, providing that the initial difficulty of the school holidays is overcome. Several railways have already adopted the policy of inaugurating the summer train services on July 1, and on the southern railways the holiday arrangements are introduced nearly in full in June. But to do much the way must be cleared by decisive action, and therefore the progressive campaign which is now being undertaken requires to be pushed forward energetically and to receive full support in all interested and affected quarters. The results will be seen in next year's summer arrangements.

* * *

The Cheshire Lines express which left Liverpool Central station for Manchester, Sheffield, Grimsby, and Harwich at 2.30 p.m. on October 15, while detained in St. James's station, was run into by the 2.35 p.m. Midland express for Stockport and St. Pancras. The two rear coaches of the stationary train were telescoped and reduced to wreckage, and the end of the third coach was smashed in, the Midland engine being overturned. The two last vehicles were occupied by foreign passengers brought over by the *Campania*, and bound mostly for the Continent. Six persons were killed and about 25 injured. One of the passengers has stated that while the train was passing through the tunnel a fellow-passenger pulled the communication cord. This led to the train being stopped. In the official list of the killed appears the name of Mrs. Owens, of London, daughter of the late Sir Charles Scotter, for many years chairman of the London and South Western Railway, and sister-in-law of Mr. Young, accountant to the Cheshire Lines Committee. At the Board of Trade inquiry held by Colonel Druitt, the signalman admitted that the accident was caused by confusion between himself and the telephone booking boy. He had allowed the boy to work the signals on his instructions, though this was not the direct cause of his mistake.

* * *

Appeals brought at previous sessions by the Great Northern Railway (Ireland) in connection with valuations on lines running through local areas was recently heard by the Belfast Recorder. Among the witnesses was Mr. Glover, Locomotive Superintendent of the Great Northern, who stated that the locomotive expenses on the whole railway for 1911 were £201,810. The entire value of the engines—191 engines and 7 motors—on the Great Northern lines, at the end of 1911 was £466,222. An engine could not now be bought for £2,000. The highest figure paid for an engine by his company was £3,850. In England over £4,000 was frequently paid for an engine. On October 13, it was announced that an arrangement had been made between the Belfast Corporation and the Great Northern Company under which the latter will make an increased yearly payment of about £500 to the city rates annually for five years.

* * *

Sir Frank Ree, General Manager, London and North Western Railway, has informed a joint committee of the Coventry and Nuneaton Councils, formed for the purpose of securing improved railway facilities, that three additional trains would be put on. Owing to a local company having started a motor-omnibus service between Nuneaton and Bedworth, the railway company would for the present defer putting on its proposed road motor service. The committee expressed the hope that at no distant date the company would erect a station at Radford, and also bear in mind the suggestion made by the deputation that at some future date the line between Coventry and Nuneaton may be duplicated so as to provide facilities for a service of electrically-driven trains.

* * *

It is interesting to learn that the Metropolitan Railway Company, in accordance with what was generally understood when they took over the management of the Great Northern and City Railway, have inaugurated a new and accelerated service between Finsbury Park and Moorgate Street, the time on journey having been reduced to 10½ minutes. The first and last trains from Moorgate Street to Finsbury Park leave at 5.46 a.m. and 11.55 p.m., and Finsbury Park to Moorgate Street 5.40 a.m. and 11.47 p.m. respectively.

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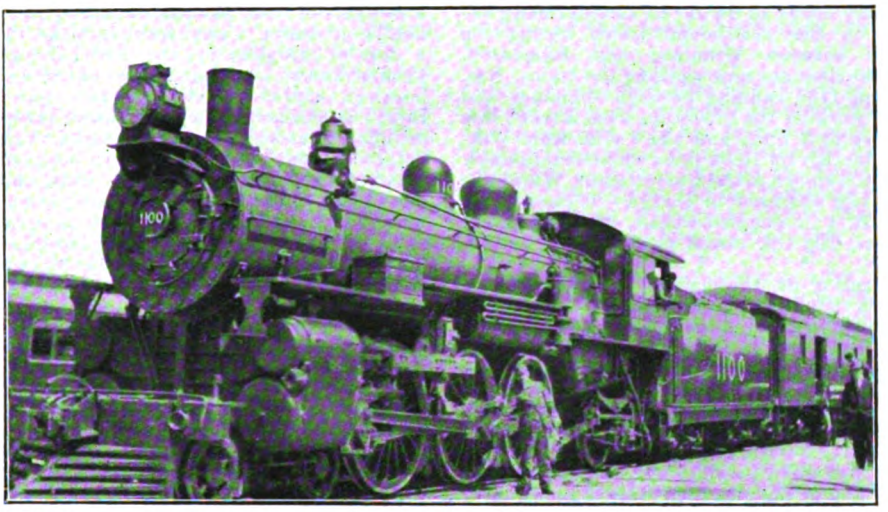

Photo] [*R. L. Burge.*

GRAND TRUNK PACIFIC RAILWAY: 4–6–2 LOCOMOTIVE AT WINNIPEG.

A READER at Calgary writes:—"The following notes were culled from a scrap heap of disused rails some miles outside Calgary among the usual litter left by contractors, who, in this case, had been working on the C.P.R. Irrigation Ditch, which here runs parallel with the main line from Montreal to Vancouver, and the newly laid Tofield-Calgary Branch of the Grand Trunk Pacific. They were covered in sand and overgrowing vegetation, but, having noticed one, curiosity lead me to examine the others, some 30 altogether. The variety is remarkable, and the dates and particulars, in some cases almost eaten away by rust, are, I believe, not destitute of interest. The rails were marked as follows:—

Mersey Steel, 1875, P.W.C.
22, Moss Bay Steel, VI., 80, Sanders Bros.
Barrow Steel, XM., 1880, C.P.R. (132).
C.P.R. Steel Krupp, 1881.
West Cumberland Steel, 1882, C.P.R.
Barrow Steel, 6M., 1882, C.P.R. (67).
C.P.R. Steel, S.J.C., 83.
Cammell Sheffield Toughened Steel, C.P.R., 1883.
C.P.R. Steel, Krupp, 1883.
West Cumberland Steel, 1887, C.P.R.

The present track is laid with rails marked:—
Algoma Steel, 80 lb., 1905, C.P.R.
Algoma Steel, 85 lb., Sec. 113, 1912."

* * *

GASOLENE-ELECTRIC cars appear to find increasing favour in the United States for intermediate and branch traffic of a rail-motor-car character. On the Pittsburg and Lake Erie Railroad a train consisting of a General Electric Company's car of this class, with a trailer, has been in operation for nearly a year. It runs on the main line between the ordinary steam-driven trains, and is utilized for local passenger service between Pittsburg, Pennsylvania, and the town of College. The distance between Pittsburg and College is just over 31 miles, and the run includes three stops. It is stated that the train can average 50 miles an hour, and that actual times have been recorded between the terminal stations, with three stops, as low as 49 min., while with two stops the distance has been covered in 42 min. The car seats 42 persons, while the trailer accommodates 80 passengers. The motor-car has a rear-platform entrance, and the trailer platform entrances both front and rear. In the motor-car there are three sections, ordinary and smoking compartments; and the drivers' division. The total weight of the motor-car is 36 tons, and that of the trailer 22 tons.

* * *

AN Italian correspondent writes to us as follows from Varallo, Novara, northern Italy:—"To supplement the particulars given in the RAILWAY MAGAZINE for September (page 260), relating to the construction of the railway from Nice to Vievola, I may add that since September 1st the line to Tenda has been open to public traffic, the new branch being five miles long. The height of Vievola (which was the terminus for 13 years) is 8,344 ft., and of Tenda 6,144 ft., the distance between the two points having been artificially decreased by the construction of two curved tunnels, one of which is a mile long. In the new branch there are in all ten tunnels. The last section of the railway from Tenda to the French territory will be completed in 1915, but the connecting works on the French side are not at present proceeding quite so rapidly." Our correspondent entertains such a high opinion of the RAILWAY MAGAZINE that he requests to be added to the list of regular subscribers.

* * *

MR. R. L. BURGE, an old-standing reader of the RAILWAY MAGAZINE from No. 1, and who is resident in Winnipeg, sends two photos of Grand Trunk Pacific locomotives. The "Pacific" illustrated is one of 15 built last year by the American Locomotive Co. The 629 class previously employed were not able to cope with

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the heavy loads of 14 or 15 cars formerly required on the west-bound trains during the summer between Winnipeg and Edmonton. The 1100 class are now working the trains, Nos. 1100 and 1106 running between Winnipeg and Rivers, working the 9.35 a.m. from Rivers, due Winnipeg at 2 p.m., and the 6 p.m. from Winnipeg, due Rivers 10.35 p.m., on alternate days. No. 1100 is shown in the Union Depôt, Winnipeg, with driver Gilchrist in charge. These engines have 6 ft. 1 in. coupled wheels, 22 in. by 28 in. cylinders, 200 lbs. steam pressure.

* * *

PRESIDING at the general meeting of the Ottoman Railway from Smyrna to Aidin, Lord Rathmore stated that although the receipts for the half-year to June 30 last did not come up to those of the "record" year 1912, they were with that exception the best the company had ever obtained in any preceding year for the first six months' working, notwithstanding the difficulties and trials through which the Ottoman Empire had been passing, and the influence of the war and of the unsettled state of the country on all commercial undertakings there, especially on an enterprise which worked without Government assistance of any kind. Reports from Smyrna were decidedly encouraging.

* * *

THE first year's working of the railway from Zanzibar to Bububu since its purchase by the Government shows a surplus of over £1,200, the total receipts having been £4,400, and the working expenses £3,200. Nearly 462,000 passengers were carried, the fares being unusually low—6¾ miles for 2½d. In addition to the line, the State acquired control of the local electric lighting and telephone systems. Metallic filament lamps are now seen in the streets, and the use of the telephone is rapidly extending.

* * *

IN order to cope with increasing traffic demands, a new wagon repairing shop is to be constructed by the Belgian State Railway Administration at Monceau, near Charleroi, with maintenance and erecting shops at Meirelbeke, near Ghent, and at Kinkempois, near Liège. A new railway is to be built from Heppen, on the line from Moll to Diest, to a point on the Meuse near the Belgian-Dutch frontier. The line will cross several coal concessions in the new mining district of Limburg. A new line in conjunction with the Dutch State Railways is proposed from Sittard across the German territory. This extension will enable traffic to Germany to be accelerated, particularly that starting from Antwerp.

* *

IN place of the somewhat antiquated saloon carriages which have done duty for about twenty years as the basis of the special train used by the President of the French Republic for Presidential journeys, a new train is to be built, at a cost of £20,000, by the Paris, Lyons and Mediterranean Company, the expense being, however, shared by all the other companies. It will be similar to the old train in that it will include reception-rooms, a study, bedroom, bathroom, etc.; but with modern bogie vehicles constructed according to recent ideas, and with due regard to the fact that in some respects the President is in the same position as a reigning monarch, and the Presidential train should therefore be a fit companion to the royal trains in use here and in various Continental countries.

* * *

THE Dutch Government has arranged for the construction of an electric railway between Maestricht and Aix-la-Chapelle, *viâ* Vaals, with a branch from Guelpen to Wijlre. At Maestricht, a tramway is also to be constructed to work in conjunction with the projected railway. Current will be supplied by the central power station of the State coal mines at Heerlen, through the Société de Distributions Electriques of Limburg, which has already laid the high-tension lines in the region crossed. The State has granted a subsidy, and the province and the communes interested are also contributing.

* * *

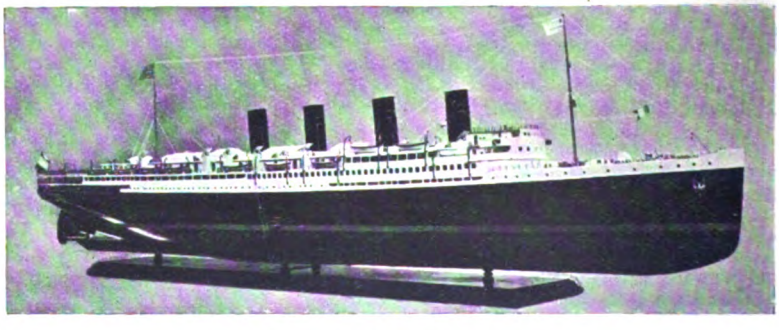
A SYNDICATE of French capitalists has obtained a concession from the Italian government for the construction of an underground railway in Naples, and that city will soon have the further advantage of an express electric line to Rome.

* * *

THE Grand Trunk Pacific have extended their main line service west of Tete Jaune to mile 1190, bringing the line to the second crossing of the Fraser river, which is 94 miles west of Tete Jaune.

———

THE "Compagnie Génerale Transatlantique" have recently ordered through the Paris Agency of Messrs. Bassett-Lowke, Ltd., ten models of their latest passenger liner, *France*, which is extensively used for trans-atlantic service. The models are constructed to a scale of one hundredth full size, each measuring approximately 6 ft. 6 in. in length; and the saloons, spacious promenade deck, efficiently equipped life-boats, deck fittings and other details are faithfully



MODEL OF STEAMER *France*.
Built for La Compagnie Génerale Transatlantique by Messrs. Bassett-Lowke, Ltd.

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reproduced. The models are now on exhibition in the "Compagnie Generale's" offices in different parts of the world. A photograph of one of these models is reproduced on the preceding page.

* * *

RAILWAY canvassers, travellers and others will find the "Mephisto" copying pencils—supplied by Messrs. L. & C. Hardtmuth, Ltd., of "Koh-i-noor" pencil fame—very convenient and satisfactory in use. Copying pencils are esteemed because of their smooth writing, but for manifolding purposes they are not usually commended. "Mephisto" indelible pencils combine smoothness of writing with strength, freedom from grit and ability to bear pressure, and are therefore well suited for manifolding work. Indeed, these pencils give splendid results when thus used. The copies come out exceptionally clearly, and the writing does not smear, while the pencils keep their points very well, whether used for heavy duties or in ordinary ways. Two degrees are made, medium and hard, sold at 2d. each, or by the dozen 1s. 8d. for the medium and 1s. 9d. for the hard. Half-length pencils, with protectors, for pocket use are also supplied. It is claimed that the "Mephisto" pencils are the best indelible pencils made at the price; and they have a world-wide sale.

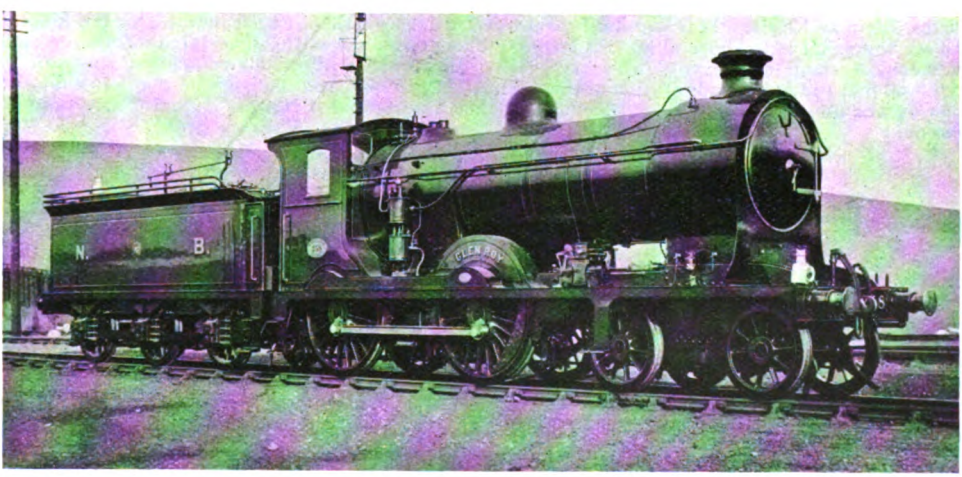
* * *

WE are informed that in addition to engines already equipped, over 230 are now being fitted in this country with the Robinson superheater. Among foreign and Colonial railways using this apparatus may be mentioned the Buenos Ayres and Pacific, Great Indian Peninsula, Buenos Ayres Midland, San Paulo, Great Western of Brazil and Bengal Nagpur Railways.

* * *

THE Great Western Railway have recently placed an order with the Railway Track Supply Co. (of Great Britain), 81, Gracechurch Street, London, E.C., for one Buckwalter Electric Industrial Truck, for use at their Swindon Works. This, we believe, is the first truck of its kind ordered for use in Great Britain. The manufacturers of the Buckwalter Trucks have standardised four types of trucks for railway platforms, locomotive machine shops, docks, etc. Further particulars can be obtained from The Railway Track Supply Co., 81, Gracechurch Street, E.C., on application.

New Superheater 4-4-0 Locomotive ("Intermediate" Class): North British Railway.



WE are indebted to Mr. W. P. Reid, Locomotive Superintendent, North British Railway, for photograph and particulars of one of the new "Intermediate" class engines now being placed in service by him, and to be known as the "Glen" class. They are to amplify the 6 ft. 4–4–0 engines used on the West Highland and other steeply graded sections. Five are to be fitted with Schmidt and five with Robinson superheaters. Names and numbers were given on page 263 of the September RAILWAY MAGAZINE. Leading dimensions are: Cylinders, 20 in. by 26 in.; coupled wheels, 6 ft. diameter; steam pressure, 165 lbs. per sq. in.; heating surface, 1,640·7 sq. ft.; grate area, 21·13 sq. ft.

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Railway and Engineering Literature.

ENGINEERING AS A PROFESSION. [By A. P. M. Fleming, M.I.E.E. and R. W. Bailey, Wh.Sc. John Long, Limited, Crown 8vo, cloth, 288 pp. Price 2s. 6d. net]. This book is designed as a guide to the scope, training and opportunities for advancement afforded by the engineering professions. The authors—the second of whom is principal of the Technical Institute, Crewe—have produced this volume for the guidance of those seeking to enter, or who are already engaged in the engineering profession. It defines the scope of engineering in all its branches, compares engineering with other well established professions, outlines methods of training and how, where, and at what expense, this training may be obtained, for those of means, as well as for those who have to take advantage of scholarships and other financial assistance. Considerable attention has been given to the subject of appointments open to young engineers, with a view to providing a definite object towards which their training and efforts may be specially directed.

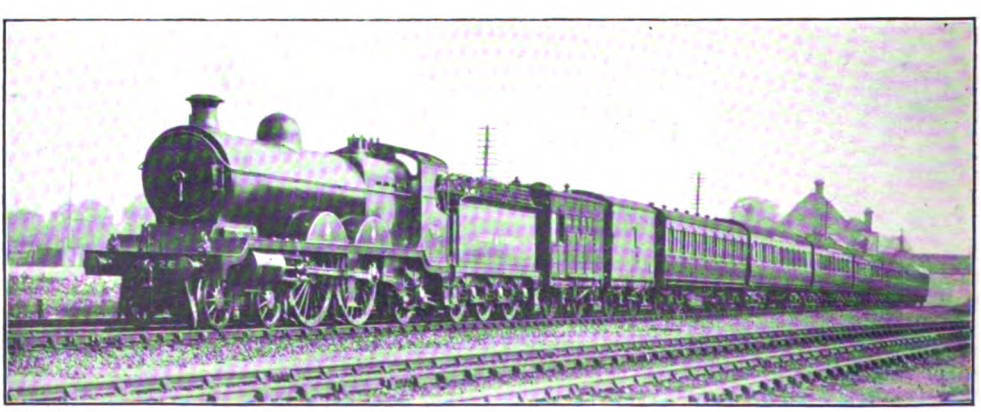
* * *

BEHIND THE HIGHLAND ENGINES. [By "Scrutator." R. Carruthers & Sons, *Courier* Office, Inverness. Price, 4d.]. This booklet, a review of train running on the Highland Railway, contains a series of records of work done by various engines, accompanied by particulars as to conditions, methods, and events on the main lines between Perth and Inverness, north of the "capital of the Highlands," and eastwards to Forres, Elgin and Keith. It is a useful brochure, and we commend it to those of our readers—by no means a small contingent—who know the Highland line and profess admiration of the work done by the Jones and Drummond locomotives thereon.

THE RAILWAY LIBRARY AND STATISTICS, 1912. We have received from Messrs. Stromberg, Allen & Co., of Chicago, the forth series of the "Railway Library," compiled and edited by Mr. Slason Thompson, Director of the Bureau of Railway News and Statistics, Chicago. It is a valuable collection of addresses and papers on railway subjects delivered or published during the year 1912. One of the most noteworthy reproductions *in extenso* is the address delivered by Mr. Francis H. Dent, General Manager of the South Eastern and Chatham Railway, before the Railway Students' Association, at the London School of Economics, on the subject of "Railway Nationalization." Railway rates and valuation occupy a prominent place, and the problem of safety in railway operation receives particular attention. Reference to the index shows how really comprehensive is the volume in the variety of its contents, and Mr. Thompson is again to be congratulated upon the success of his labours.

* * *

THE DUTIES OF A LOCOMOTIVE FIREMAN. [The Locomotive Publishing Co., Ltd. Price 4d.] This booklet is the latest addition to the series of four-penny brochures published by the proprietors of the *Locomotive Magazine*. It is designed, as its title indicates, to set forth the duties of a locomotive fireman, incidentally referring to many practical matters, difficulties and conditions which may arise, and with a few diagrams contains a wealth of useful information within its 43 pages. Previous booklets of this series are "Questions and Answers on the Locomotive"; "Locomotive Failures"; and "Questions and Answers on the Vacuum Brake."



Photo] [*F. E. Mackay.*

GREAT CENTRAL RAILWAY:

12.15 p.m. London-Manchester Luncheon Car Express 4–4–2 Locomotive No. 266.

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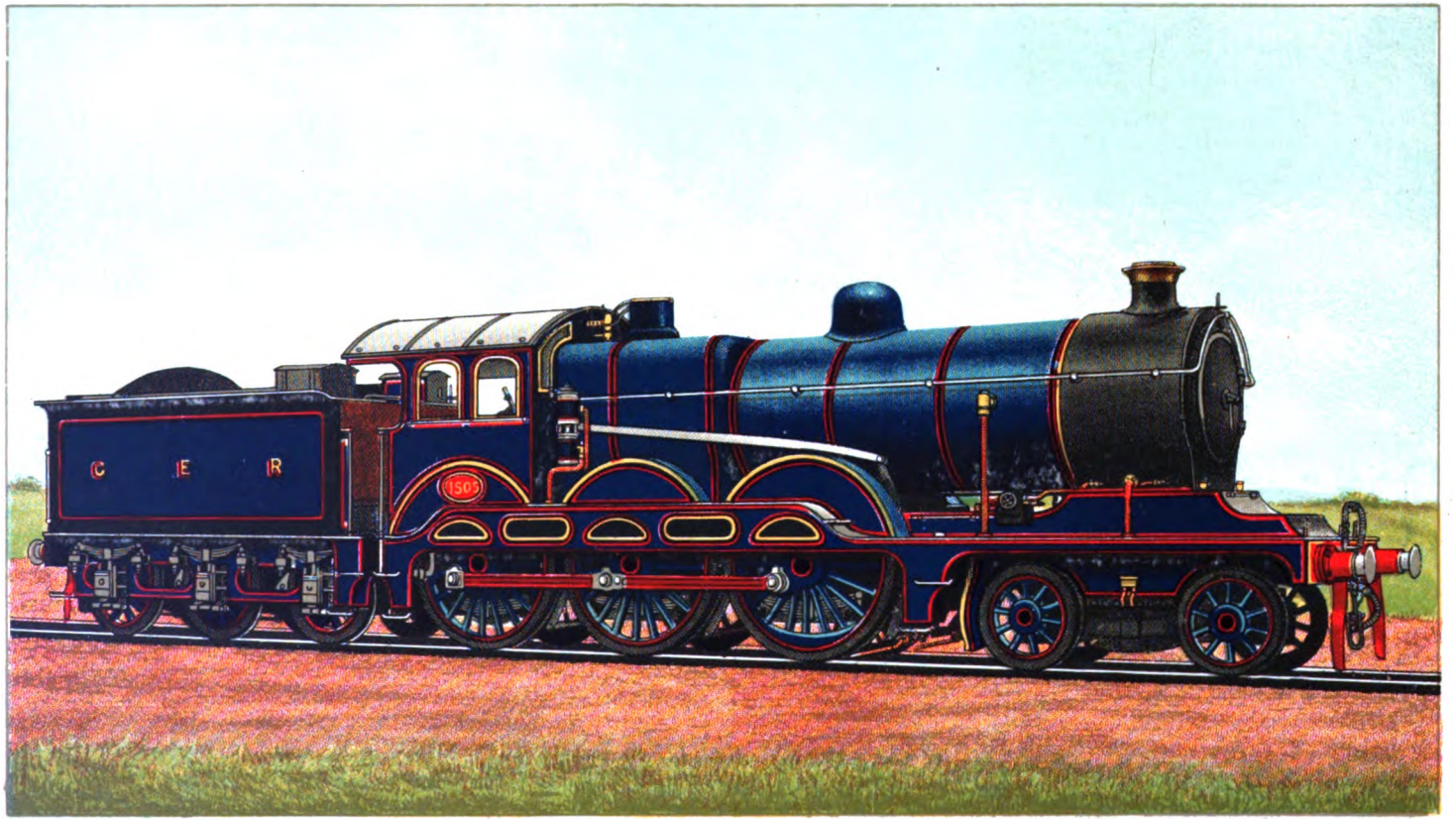

GREAT EASTERN RAILWAY SIX-COUPLED EXPRESS LOCOMOTIVE, No. 1505.

FITTED WITH SCHMIDT SUPERHEATER. MR. A. J. HILL, LOCOMOTIVE ENGINEER.

CYLINDERS, 20IN. DIAMETER 28IN. STROKE. DIAMETER OF COUPLED WHEELS, 6FT. 6IN. STEAM PRESSURE, 180LBS. PER SQ. IN.

TOTAL HEATING SURFACE, 1918·9 SQ. FT. GRATE AREA, 26·5 SQ. FT.

WEIGHT OF ENGINE IN WORKING ORDER, 63 TONS.

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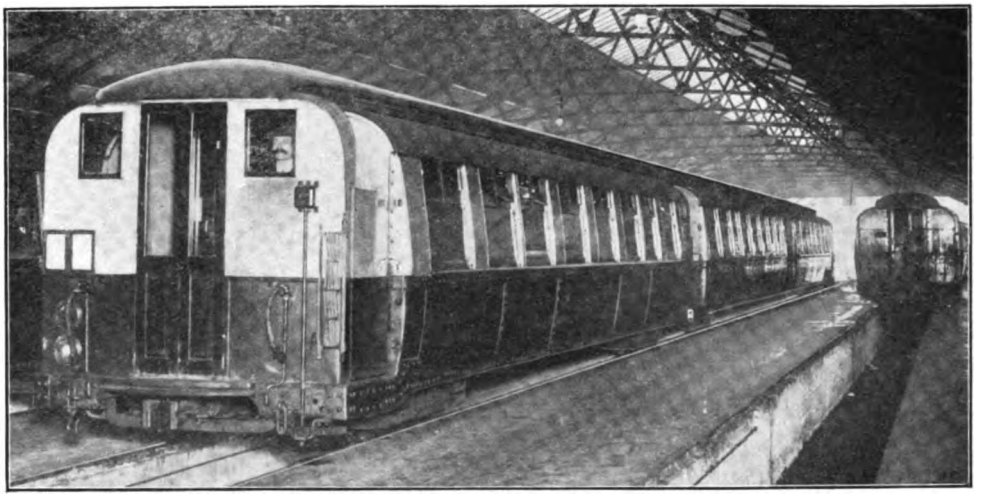

NEW ROLLING STOCK: BAKER STREET AND WATERLOO RAILWAY.
Showing trailer car with covered platform for motorman.

The Engineering Development of the London Electric and Metropolitan District Railways.

By J. F. GAIRNS.

ALTHOUGH the system of underground and "tube" railways serving the Metropolis is already very complete, and provides means for convenient, comfortable, cheap and expeditious travel in all directions, there are still certain deficiencies; and in order to remedy them and to further improve facilities several new works are in progress, and in some cases nearing completion. Thus on the Metropolitan Railway the transformation of Baker Street station is well in hand and good progress is being made with the widenings from Finchley Road. The Great Northern and City and City and South London "tubes" are also providing material for development and improvement. It is, however, the London Electric and Metropolitan District Railways which at present call for principal attention because of the extensions, reconstruction works and the like now in hand, and it will be sufficient to confine attention thereto, engineering aspects being selected for consideration.

Hitherto Charing Cross has suffered somewhat as an exchange station in that the "Hampstead" station is not connected with those of the District and "Bakerloo" lines, and communication between the two Embankment stations is not as convenient as it might be. Hence the metamorphosis of the District station, above and below ground. The essential feature of the new works is the loop extension of the "Hampstead" tube, doing away with terminal traffic entirely and incidentally enabling direct connection to be made with the District and Bakerloo stations.

For this work Messrs. John Mowlem & Co., Ltd., are contractors, Mr. H. H. Dalrymple-Hay being Consulting Engineer, Mr. G. Blacklock, Resident Engineer on behalf of the London Electric Railway, and Mr. W. Rowell, the Contractor's Agent.

The work entailed by this extension is actually much more complicated than the situation appears to demand, owing to the special conditions imposed by the location. The present terminus of the "Hampstead"

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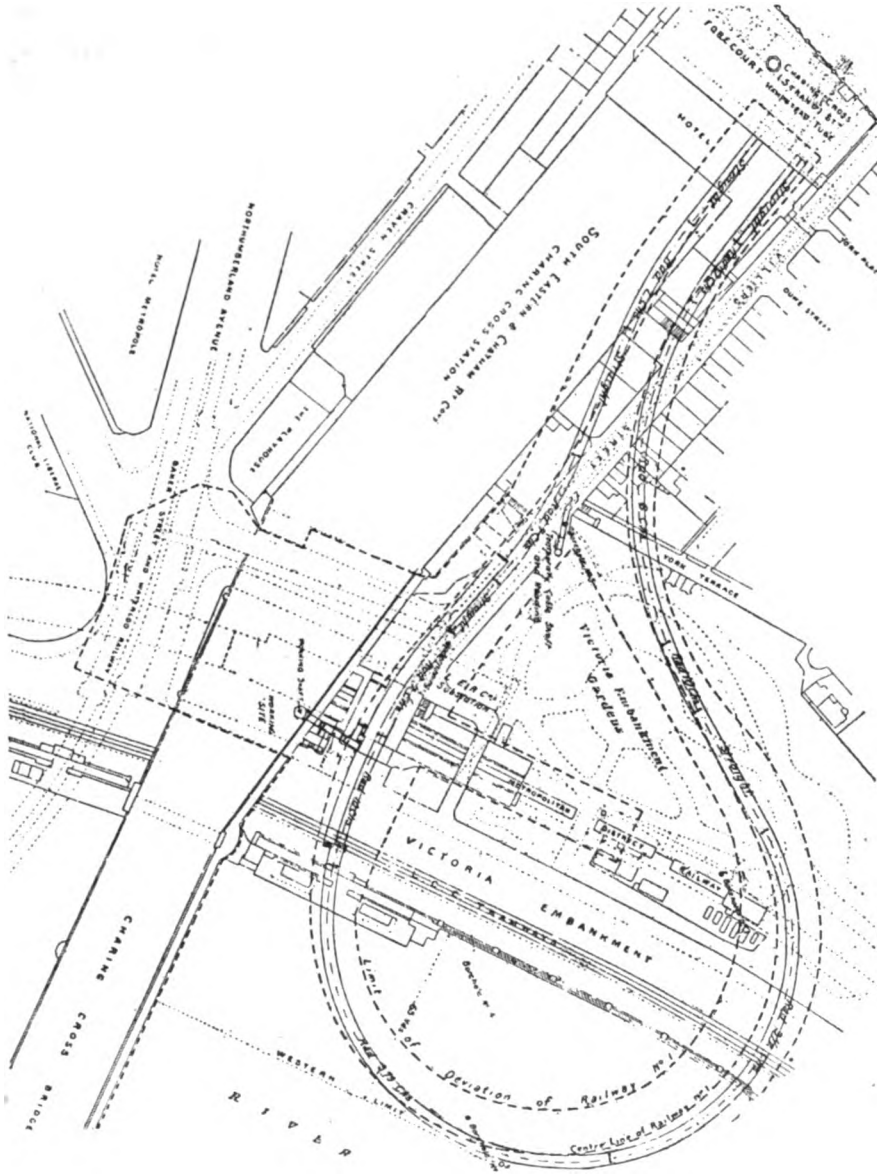

THE LOOP EXTENSION OF THE "HAMPSTEAD" TUBE AT CHARING CROSS.

tube is under the forecourt of the South Eastern and Chatham station, so that some 200 yards have to be traversed on foot to reach the stations on the Embankment. To complete this connection an extension single line loop is being constructed, as shown above, so that south-bound trains will run on from the present terminus, round the loop, to a new single-platform station connected with the District and Bakerloo stations, and thence rejoin the existing north-bound line. In brief, the arrangement is similar to that adopted at Wood Lane (Central London Railway), except that the whole construction is in tube, far below ground level. The total length of track included in the extension is 880 yards, the extreme limit being 65 yards beyond the Embankment wall under the bed of the river.

The station platform is about 350 ft. long, and the sharpest radius of curvature 3½ chains. At its outermost part the top of the tube is about 10 ft. below the river bed. To

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maintain communication with the "Bakerloo" and Metropolitan District Railways, and with the street, four "Otis" escalators will be installed, together with passenger subways. The central booking hall is located under the present District station, and from it two escalators incline on either side, two, with 28 ft. fall, to the new "Hampstead" platform, and two, with 32 ft. fall, to the "Bakerloo" station. The escalators are placed in separate tunnels, the sections differing slightly to suit the respective locations and conditions. A direct interchange passage connects the two tube stations at about platform level. Staircases also connect the present District booking hall with the central hall below serving the escalators.

The undertaking is complicated by several factors which have necessitated special provision and construction. Alongside the District station is an electrical sub-station, and it has been necessary to construct an enlargement of this to provide for future requirements. The passage between the District and the "Bakerloo" stations has also had to be considered, while a cable shaft, weighing with its superincumbent load over 1,000 tons, has required special supporting arrangements, as well as the construction of a substitute. In addition, it has been necessary to construct a series of piers, some of them over the new tube, in view of the authorised widening of the South Eastern and Chatham Railway Company's Charing Cross bridge and station. It will, therefore, be seen that considerable engineering ingenuity is entailed, and that the work is far from simple or straightforward.

A shaft was first sunk outside the Villiers Street frontage of the District station. This shaft is larger than would otherwise have been necessary, the commencement of the work consisting virtually of "cut-and-cover," in order to provide for the enlargement of the sub-station here and the erection of the supporting piers already referred to. A substantial brick casing was constructed, consisting of a thick brick wall supporting an arch, which carries the sub-station floor, the tube proper passing through this casing under the arch, so that it does not support any of the supervening weight. A somewhat similar method is also adopted for carrying the disused cable shaft already mentioned, while corresponding arrangements had to be partially made in reference to the supporting piers for the South Eastern and Chatham Railway. Indeed, for some 40 ft., it may be said that the tube itself carries none of the supervening weight, being virtually enclosed in brick arched chambers which support the load.

The working shaft from which the tube construction proper was effected is located on the Embankment side of the District station, under the South Eastern and Chatham Railway bridge. Adjacent to it one of the walls of the District station has been partially taken down, as well as the old roof, and the construction of the new booking hall and connecting passages is well in hand. Otherwise all the work involved is far underground. At first a side passage from the working shaft was made connecting with an 8 ft. tunnel proceeding some distance along the centre line of the tube to a position near the "cut-and-cover" shaft already mentioned. The large station shield, 21 ft. 2½ in. diameter, was erected by means of the latter and then driven towards the river. Owing to the presence of the 8 ft. tunnel first made from the working shaft it was possible to remove the "muck" from the front of the shield instead of from behind as usual, until the side connection with the working shaft had been passed. Work then proceeded according to usual methods, and all tube construction has since been done by means of the working shaft, the "cut-and-cover" shaft being reserved entirely for the subsidiary works over the tube and associated with the station buildings.

The whole of the tunnelling is finished, except the construction of some of the passages, and the permanent-way is already laid for about three-quarters of the length of new "tube" involved. The ordinary tunnels consist of 12 ft. 6 in. tubes (12 ft. 9 in. on curves), while the station tunnel is 21 ft. 2½ in. diameter. The top of the station tunnel is in the water bearing ballast strata above the London clay, and thus necessitated special precautions during construction. Two shields were employed for the loop and running tunnels, and one large one for the station. The shields employed were of the hooded type, with hood and water seal, as used in the construction of the Baker Street and Waterloo Railway. The clay-pocket system of tunnelling was adopted. This was first introduced by Mr. Dalrymple-Hay in the construction of the Waterloo and City Railway, and perfected for use in making the Baker Street and Waterloo Railway.

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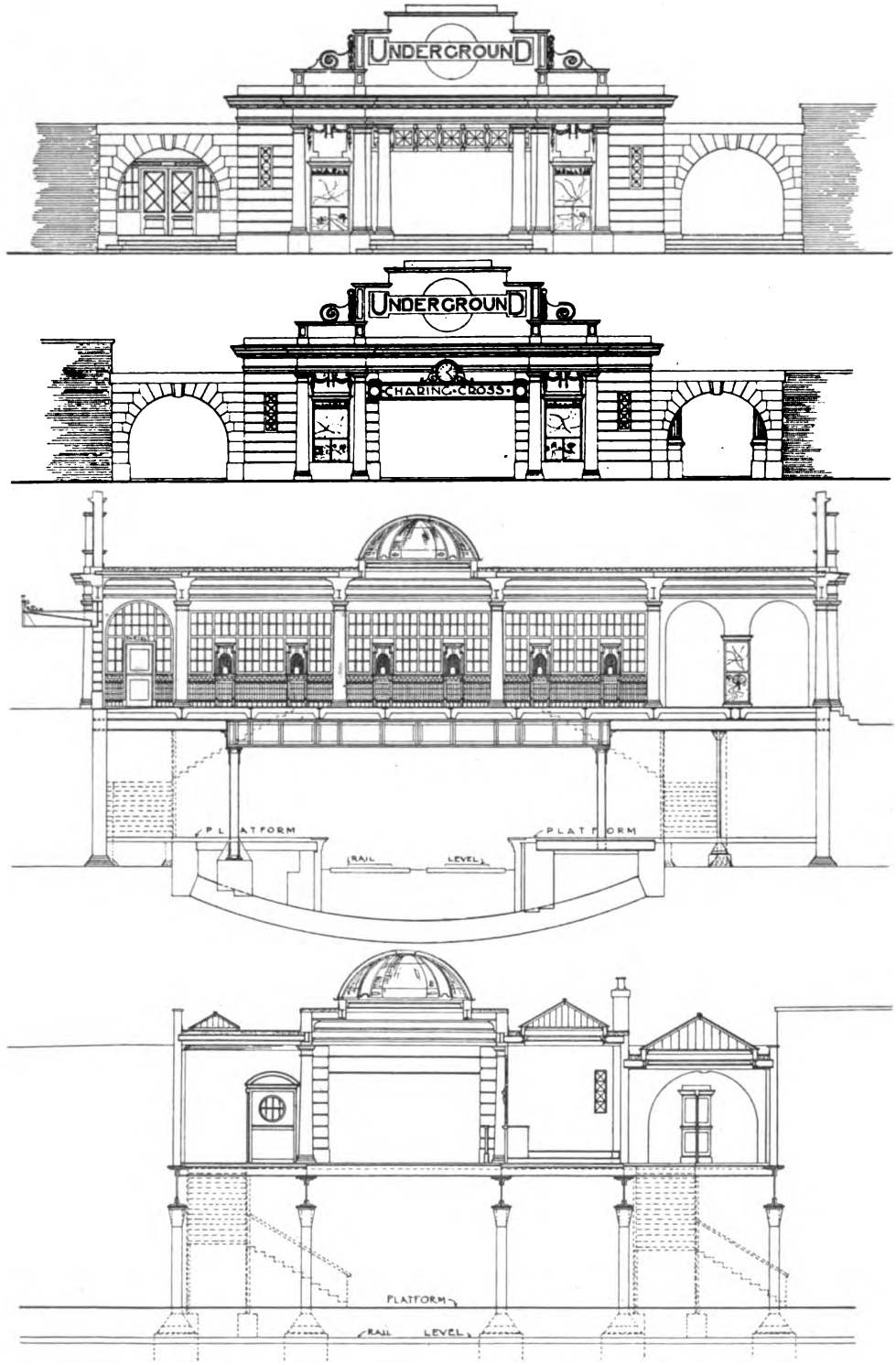

New Station Buildings at Charing Cross Underground Station.

EMBANKMENT AND VILLIERS STREET FRONTAGES.

CROSS SECTION OF NEW BOOKING HALL OVER METROPOLITAN DISTRICT STATION.

LONGITUDINAL SECTION OF NEW BOOKING HALL, SHOWING ACCESS TO PLATFORMS.

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The top of the tube approached so nearly to the bed of the river that special measures had to be taken to proportion the air pressure to the weight of water. For this purpose a special tide gauge was erected on the London County Council landing stage, the dial being prepared to show the required air pressure alongside the tide level indicator. This was referred to from time to time by the engineer in charge of the air compressors who adjusted the p essure as required. To reduce the frequency of journeys across the Embankment for this purpose the engineer also had a special dial in the engine-room, and this being adjusted after each inspection of the tide gauge enabled him to forecast with approximate accuracy the conditions which would apply for two or three hours ahead. From 8½ to about 18 lbs. per square inch under the river, and from 2 to 5 lbs. on the land sections, were the usual pressures employed; and it is worthy of note that no case of sickness has occurred among the men, nor have any special difficulties arisen, the work proceeding quite smoothly, the clay-pocket system of tunnelling proving entirely satisfactory, while the water seal on the shield has never had to show its efficiency in coping with an inrush of water.

All the machinery chambers for the escalators and the sub-station are below water level, and they have been lined with cast-iron segments and the joints specially made and caulked to ensure water-tight connections. The upper ends of the escalator tunnels are immediately below the District station, so that underpinning was required to a considerable extent to carry the weight above. It is interesting to note, also, that as a further precaution against ingress of water, the connections between passages and the platform tube are made by means of a special concrete joint, with steel plates above.

Messrs. Mowlem & Co. have carried out the whole of the work below ground except that the staff of the London Electric Railway have laid the permanent way and otherwise dealt with finishing and equipment details. The Stanton Iron Works, of Nottingham, supplied most of the iron work, and Matthew T. Shaw the steel. The escalators have been supplied by the Otis Elevator Company, Limited. It is anticipated that trains will be running over the new loop in March next.

Above ground the District station is already beginning to take shape in its new guise. The frontages on both sides will be of white Portland stone, artistically designed, and giving a wide passage way, surmounted by a glass dome, from the Embankment to Villiers Street. On one side of the passage way will be the booking offices, clear of the usual path of traffic, and from each side will descend the new staircases to the District platforms and leading to the underground circulating area and booking hall serving the escalators to the two "tube" stations. Separate staircases leading directly into the street will be provided for exit traffic. Although necessarily only a single storey erection the station buildings will constitute an artistic addition to the frontage along the Embankment, and will harmonise with the London County Council offices adjacent. Mr. H. W. Ford, for many years resident architect to the Metropolitan District Railway Company, and who has carried out most of the reconstruction involved by electrification, is the architect.

It is difficult to measure the value of the improvements at Charing Cross. The fact that the 200 yards or so required to pass between the Hampstead and the Embankment stations will be avoided will be of immense importance, involving a saving of at least five minutes on every interchange journey. There will be no need for passengers to go out into the street, a consideration in wet weather, besides which a stranger is liable to get rather confused under present conditions. Interchange "Bakerloo-Hampstead" passengers will not, indeed, require to ascend and then descend again at all, while the triple interchange facilities which will shortly be provided will render journeys between, say, Euston and Waterloo, Golders Green and Mansion House, Victoria and Euston, almost as convenient as if direct lines existed.

It is expected that the extension of the "Bakerloo" line to Paddington will be opened for traffic on November 30th. The station is under the arrival cab-road at the Great Western terminus, with "Otis" escalators from the "tube" booking hall to the platforms. In this case the two escalators are placed in one tunnel with a fixed stairway between. The booking hall is only about 20 ft. below the roadway of London Street and is connected with the street by ordinary stairways. Connection is also being provided with the Metropolitan station in Praed Street by means of one arm of the intercommunicating passage giving access to the Great Western terminus.

The platforms of the "tube" station are in separate tunnels and cross-overs beyond

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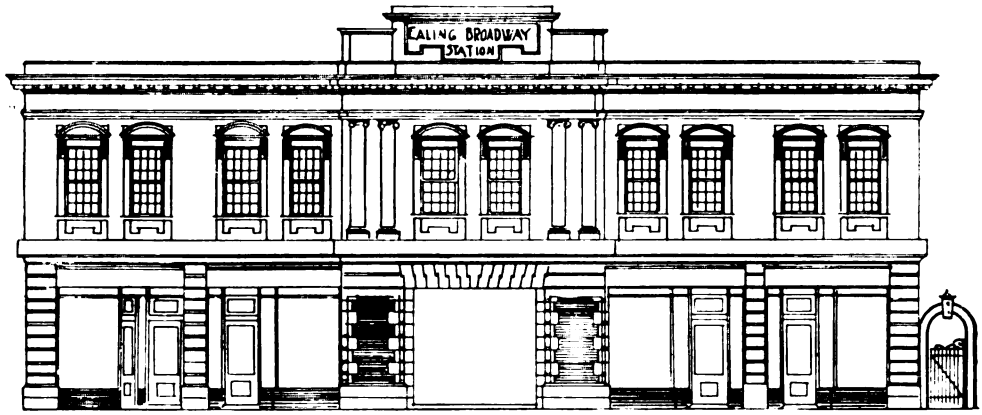

THE NEW STATION BUILDINGS AT EALING BROADWAY: METROPOLITAN DISTRICT RAILWAY.

provide for the reversal of terminating trains. The terminal stubs are, however, being extended, and good progress has already been made with the continuation tubes constituting the Queen's Park extension to join the London and North Western Railway. Messrs. Mowlem & Co. have carried out the Edgware Road-Paddington extension, and Messrs. Scott & Middleton are the contractors for the Queen's Park extension, Mr. I. J. Jones being Resident Engineer on behalf of the London Electric Railway, and Mr. Edgar Middleton the Contractor's Agent, the whole of the works being carried out to the design and under the direction of Mr. Dalrymple-Hay.

Signalling on the extensions at Charing Cross and to Paddington is, of course, the standard electro-pneumatic equipment supplied by the McKenzie, Holland & Westinghouse Power Signal Co., Ltd., and which has realised so remarkable efficiency on the District and London Electric Railways.

There are several other developments in progress on the District Railway which also call for consideration. The principal undertaking is that west of Earl's Court. The object is to enable trains from Putney Bridge or Wimbledon to approach Earl's Court station without fouling the down Ealing and Addison Road lines, or to allow trains for the latter routes to leave irrespective of Wimbledon line services. It is expected that the new junctions will be brought into use at the beginning of the new year. The up Wimbledon line and the down Ealing line are both located on new ground, some distance away from the existing tracks. The former new line is for part of its length of 1,400 ft. placed in

THE NEW STATION BUILDINGS AT ALDGATE EAST: METROPOLITAN AND METROPOLITAN DISTRICT RAILWAYS.

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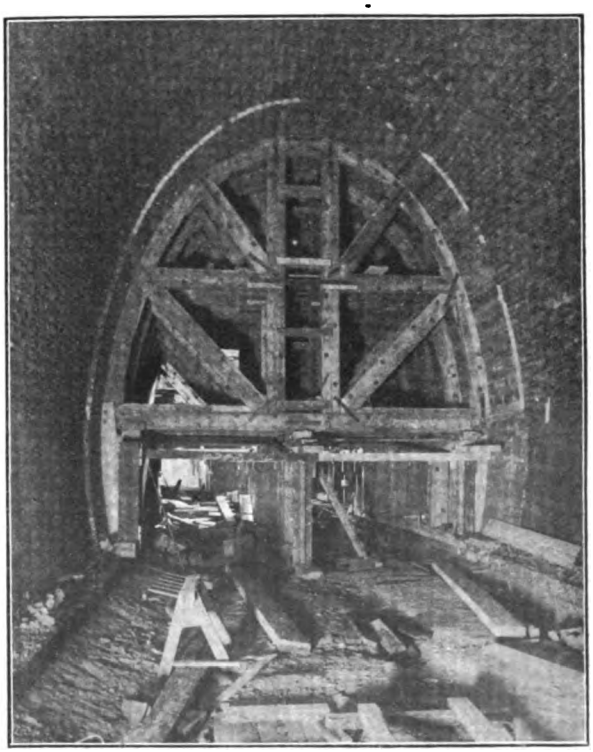
WALHAM GREEN STATION (METROPOLITAN DISTRICT RAILWAY) AS IT IS.

tunnel, passing under the Exhibition grounds. It has been constructed on the "cut-and-cover" principle, but does not interfere with the grounds above, excepting that the surface has been restored at a higher level. The existing two lines are being utilised to duplicate the down track, so that if required two trains towards Wimbledon can be sent on to the branch, thus clearing Earl's Court station, one being kept back as desired on the curve. Or, if required, a fast train can pass a slow one here instead of in the station.

On the Ealing line the trains from Addison Road are kept distinct almost into the station. The new down line from Ealing sweeps round, crossing under the up Wimbledon line, both being in tunnel, and does not rejoin existing tracks until the junction for Ealing or Addison Road is reached. Provision is also being made so that when it becomes desirable to lay a second up line through West Kensington, it can be connected to the Addison Road up line at the junction above referred to. The whole of the work is being carried out departmentally under Mr. A. R. Cooper, the Company's Engineer, Mr. W. P. Jones being the Resident Engineer.



TUNNEL CARRYING NEW DOWN HAMMERSMITH LINE UNDER THE NEW UP WIMBLEDON LINE, BOTH BEING IN TUNNEL WHERE THE CROSSING IS MADE.

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Photo] [H. W. Barnett.

MR. Z. E. KNAPP,
Chief Engineer,
M.D., L.E., and C.L. Railways.

Photo] [G. C. Beresford.

MR. A. R. COOPER, M.INST.C.E.,
Engineer,
M.D., L.E., and C.L. Railways.

Photo] [Naudin.

MR. W. E. BLAKE,
Supt. of the Line, M.D.R.

Photo] [Lafayette.

MR. J. W. TOWLE,
Supt. of Power.

Photo] [P. Mac Donald.

MR. W. E. MANDELICK,
Secretary, all companies.

Photo] [Lang Sims.

MR. J. C. MITCHELL,
Treasurer, all companies.

Photo] [A. Hughes.

MR. S. J. WEBB,
Passenger Agent, all companies.

Photo] [Luxemburg Studios.

MR. S. B. CRITCHLEY,
Accountant,
C.L. and C.S.L. Railways.

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At Mansion House, also, interesting operations are in progress. The construction by the City Corporation of a public subway under the road outside the station has rendered a rearrangement of the booking hall and station offices necessary, and by co-operation between the railway company and the City authorities each giving the other certain rights in return for concessions, a valuable improvement is being realised. use of road-crossing passengers before they reach the booking hall proper. Advantage is also taken of the space released on street-level to enlarge the buffet leased to Messrs. Spiers & Pond. A relief exit to the back of the station and a tearoom are also being constructed in connection with the bridge serving the west-bound platforms.

Blackfriars station is also to be the scene

Photo] [*Elliot and Fry.*

MR. A. H. STANLEY.
Managing Director.

The booking hall has been lowered to the level of the subway, so that passengers from the other side of the roadway do not need to ascend again to street level. The booking office is built out under the roadway so that the full width of the hall is available for passing traffic. In the hall there will be a series of coin-freed ticket machines, for 1d., 2d. and 3d. fares, and others will be placed at the end of the subway for the of further improvements. On the down side the stairways restrict the platform area and, moreover, have to be used for both ascending and descending traffic. As rearranged, the bridge over the lines will have two stairways, one for ascent and one for descent leading down from either side to the west-bound platform, these being set back to clear the platform area, and from the over bridge a diagonal

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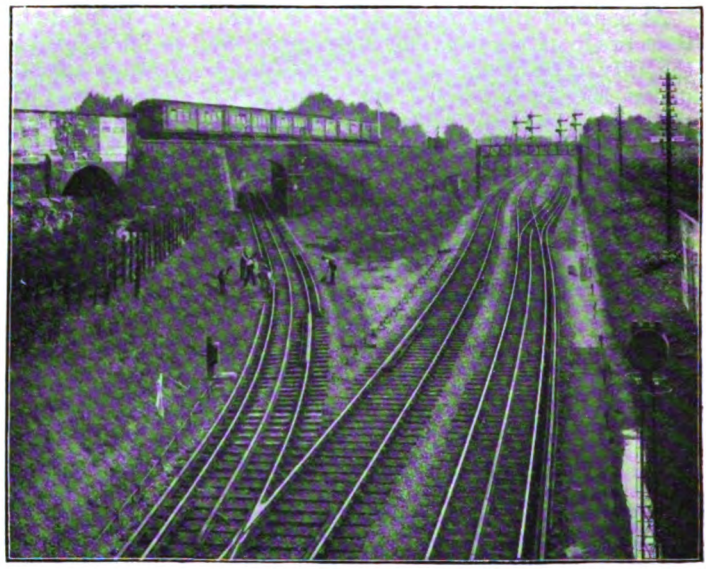
pathway is to be laid leading directly to the passage connecting with St. Paul's station.

At Parsons Green, by utilising some of the existing sidings alongside the station, both up and down lines will be duplicated for some distance, thus assisting Mr. Blake to carry out his policy of utilising every junction and "alternative-road" facility to expedite traffic. The widenings at Turnham Green, with the flying junctions there and at Acton Town, are too well known to require special consideration. It is worthy of remark, however, that at Turnham Green the peculiar situation is created that *in one signal cabin* are located two locking frames, one Westinghouse electro-pneumatic operated by a District signalman, and the other manual and with Sykes "lock-and-block" instruments operated by a London and South Western signalman.



FLYING JUNCTIONS AT TURNHAM GREEN (LOWER LEVEL).

Near Acton Town is a development which suggests interesting probabilities. The District Railway is not at present associated much with goods traffic, but here are being laid out extensive marshalling sidings. They are intended to be used for London and North Western and Midland goods trains *viâ* South Acton and the North and South Western Junction Railway, and it is anticipated that in due course selected engines of these companies will work over the District western lines as required to deal with goods and mineral traffic. At Wimbledon an additional platform is being laid by the London and South Western Railway Company for District trains, and in due course work will be commenced on that side on the construction of the Wimbledon and Sutton Railway.

A few remarks in reference to the signalling and traffic arrangements on the District Railway will also be in place. When first automatically signalled between Mansion House and South Kensington the only break was at St. James Park, where a cross-over is laid in; a locking frame being brought into use to break into the automatic system when required. There is now, however, another signal cabin at Charing Cross

FLYING JUNCTIONS AT TURNHAM GREEN (UPPER LEVEL).

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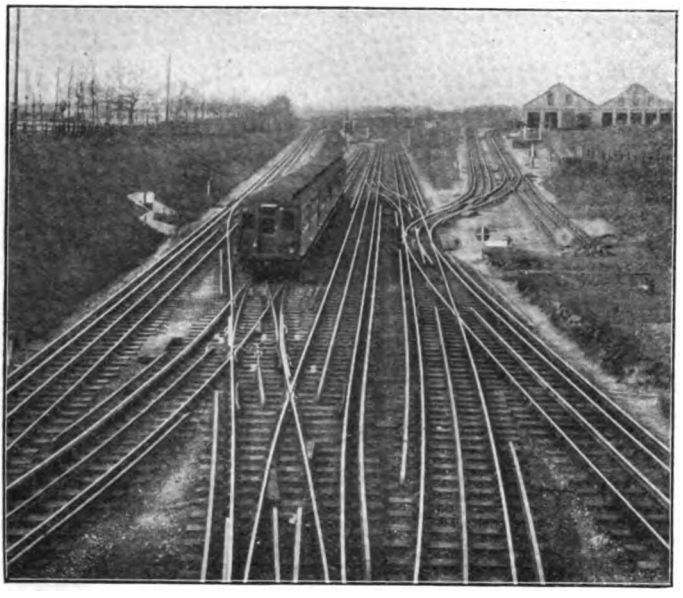
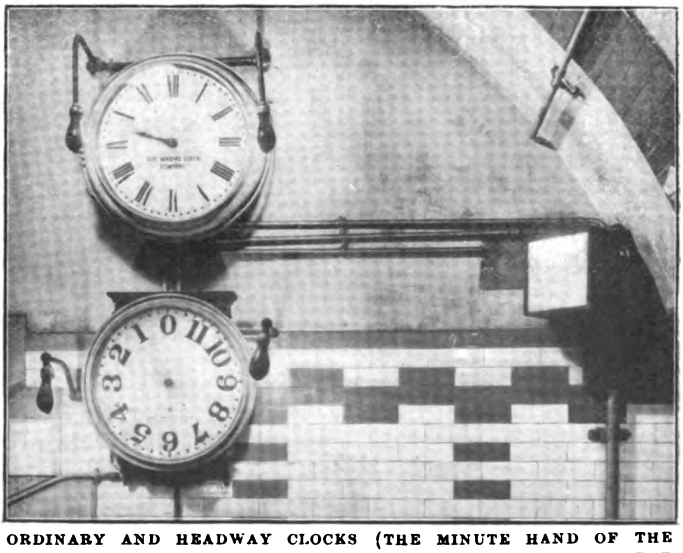


ACTON TOWN JUNCTIONS.

and a crossover road, with train describers and other accessories; and on Sundays until 4 p.m. the cabin at Mansion House is switched out, the terminal roads not being used, and trains other than Inner Circle and East Ham or Barking, reverse at Charing Cross instead. The signalman in charge at such times is, of course, connected with the Minories and South Kensington men for train describing purposes in the same way as occurs normally at Mansion House.

A large number of additional signals have also been laid in, from time to time. Thus both Victoria and Sloane Square have three home signals, the object being to create a progressive "overlap" to the automatic sections, while still retaining the full overlap in every case. The "repeaters" used on the District are not "distants" in the ordinary sense of the term. In every case they repeat the next signal ahead. In a few instances the repeaters do not go off unless two sections are clear, but they are not installed to show an open road through a series of signals as is done in usual "distant" practice. Another adjunct is a "late" or "early" indicator as installed at Mansion House, South Kensington and a few other stations. These are operated by the boy whose duty it is to record all trains passing. If a train is from 1 to 4 minutes late he operates an indicator and the figures 1, 1½, 2---4 appear on an illuminated screen alongside the starting signal or at the end of the platform. If more than 4 minutes late—an exceptional event—the word "late" only appears. The motor-man is thus informed that he is behind time, and if he can do so is required to accelerate a little to make up. Headway clocks at some of the stations show whether the train in front is sufficiently advanced to allow of running fast, or whether the headway is so close that it is necessary to take matters easily.



ORDINARY AND HEADWAY CLOCKS (THE MINUTE HAND OF THE FORMER AND THE POINTER OF THE LATTER DO NOT SHOW, AS THE PHOTOGRAPH HAD TO BE TAKEN WITH A LONG EXPOSURE BY ELECTRIC LIGHT), WITH AN "EARLY" OR "LATE" INDICATOR AS INSTALLED ON THE LONDON ELECTRIC AND METROPOLITAN DISTRICT RAILWAYS.

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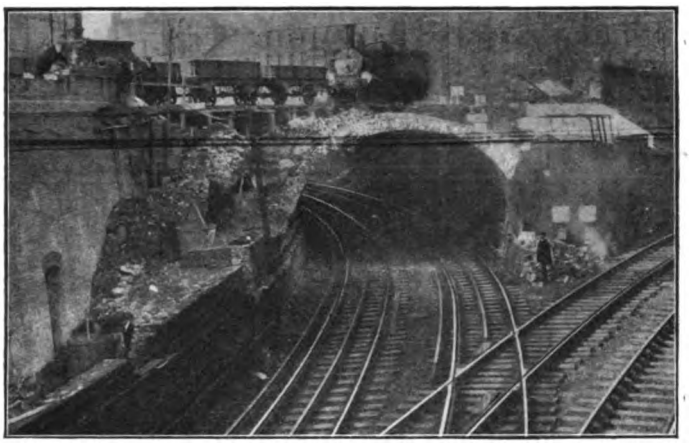

OVERBRIDGE (IN COURSE OF RECONSTRUCTION) CARRYING LINES INTO LILLIE BRIDGE DEPOT, WITH EXISTING LINES TO AND FROM HAMMERSMITH AND BRANCH TO ADDISON ROAD, SHOWING WORKS IN PROGRESS FOR CONNECTION OF NEW DOWN HAMMERSMITH LINE TO THE LEFT OF ILLUSTRATION.

As regards other features we may remark that at several places on the District Railway spring crossings are laid in. These give a continuous rail through the crossings instead of the usual gaps for the wheel flanges, but open as required when the cross-over or junction is being used. At South Kensington and many other places curves have been eased, and roads slewed and transition curves adopted to facilitate steady and reasonably fast running.

Upwards of 100 all-steel cars are already in service, and 30 others are now being constructed by the Gloucester Carriage and Wagon Co., Ltd. These, together with those at present running, are fitted with Lysaght's steel panel plates.

In respect of traffic operation Mr. Blake has obtained a wonderful record, and under normal conditions he begins to ask "serious questions" if trains are more than two or three minutes late, notwithstanding that they may be traversing the Sloane Square-Mansion House section at the rate of a good 40 trains per hour each way, and that junctions and crossings are necessarily involved at Earl's Court, South Kensington, Minories, and on the western lines. A considerable number of "specials" are run. To Southend alone nearly 13,000 passengers were conveyed in organised parties during last summer, apart from the traffic by the usual through trains. The Harrow and Uxbridge lines were also used for special excursions aggregating about 63,000 passengers. Specials have also been sent over the East London Railway since that line has been electrically operated.

The writer is indebted to Mr. H. H. Dalrymple Hay, and Mr. G. Blacklock as regards the construction of the Charing Cross and Paddington extensions of the London Electric Railway, and to Messrs. Pick, Blake, Cooper, Edmonds, Fraser and other officers of the Metropolitan District and London Electric Railways for courteous co-operation and assistance in compiling this article.

With the January Railway Magazine will be presented a splendid Colour plate of

North British Railway Express Train.

The plate will be produced from a very fine oil-painting founded on a photograph by F. E. Mackay.

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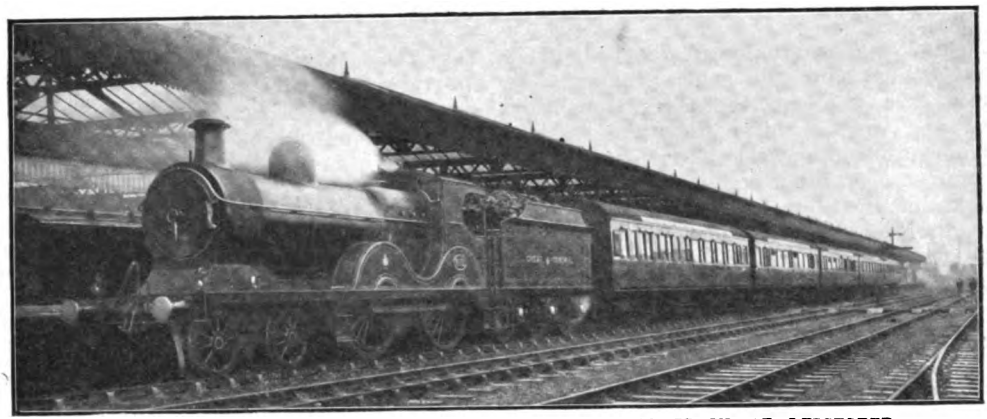

GREAT CENTRAL RAILWAY: CROSS-COUNTRY EXPRESS TRAIN AT LEICESTER.

Winter Through Carriage Services: Great Central Railway.

ALTHOUGH the tentacles of Great Central through carriage services have not as yet extended to Scotland, and only in a limited degree do Great Central trains penetrate into Wales, the company has during recent years developed a remarkable series of cross-country facilities, reaching southwards to Bournemouth and Southampton; northwards to Newcastle; eastwards to Harwich, Hull and Yarmouth; and westwards to Cardiff, Barry, Bristol and Swansea; in addition, of course, to its own extremities at Cleethorpes and, by means of the Cheshire Lines Committee's System, at Southport. Moreover, in several cases the remarkable position is created that the Great Central system provides neither terminus, the trains commencing away from Great Central metals and terminating south or west or north of the point where the owning companies lines are left again.

Some of these services have created a special traffic of their own, and their value applies all the year round, so that while certain holiday services, as those to Scarborough and Aberystwyth are not continued during the winter months, there are others which are highly appreciated because they are running at periods when such facilities may be expected to be withdrawn. This is particularly the case with some of the north to south and south-west services. Bournemouth is perhaps the most remarkable example, owing to its high favour as a winter resort for invalids, and well-to-do people able to leave the gloom and inclemency of the northern and industrial districts for the mild climate and relatively fine weather of this favourite south coast rendezvous. But similar remarks will also apply largely to the connections with Great Western trains to Torquay and other favoured places in Devon and Cornwall, as well as to a number of other resorts which are served directly by the special through trains, or can be reached by connections involving not more than one change, and that a convenient one, in the course of what would otherwise be a lengthy and tiring journey.

Co-operation between the Great Central and Great Western companies is responsible for several of the chief through train and through carriage services; and these may first receive attention. Excluding one or two shorter journey trains which are extended between Banbury and Oxford over the Great Western Railway, there are five principal services daily southwards and six northwards, with one each way on Sundays. The first of these is the breakfast and luncheon corridor express leaving Manchester (London Road) at 8.20 a.m., Huddersfield at 8.18 a.m. and Halifax at 7.47 a.m. This serves Sheffield, Nottingham and Leicester and then proceeds *viâ* Woodford (not calling) and Banbury to Oxford and thence to Bath (arrive 2.17 p.m.) and Bristol (arrive 2.39 p.m.). At Bristol connection is made with convenient Great Western trains for Weston-super-Mare, and various resorts in Devon and Cornwall, even

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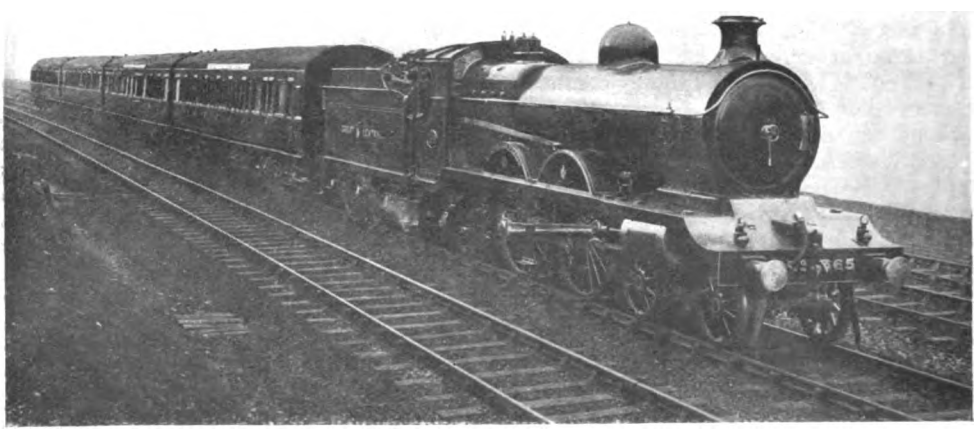
far-away Penzance being reached at a reasonable hour the same evening. In this case although the main train runs on the Great Central from the starting point, the Huddersfield and Halifax vehicles commence on other companies' lines. The next is the Luncheon Corridor express from Manchester (London Road, Great Central Railway, 10 a.m.), York (North Eastern Railway, 10.23 a.m.), and Bradford (Lancashire and Yorkshire Railway, 10 a.m.) for Oxford, Southampton and Bournemouth *viâ* Great Western and London and South Western Railways. By this service nearly all the Lancashire and Yorkshire, and North Eastern industrial towns are placed in convenient connection with the through facilities to the south coast.

The third is the longest of all, commencing at Newcastle-on-Tyne (North Eastern Railway, 9.25 a.m.) and running *viâ* York, Sheffield, Nottingham and Leicester to Banbury, thence over the Great Western to Cheltenham, Gloucester, Newport, Cardiff and Barry. This runs virtually intact from end to end as a corridor luncheon car train. The special route of this train gives it an exceptional value, as it enables many towns to be reached conveniently by through train which would otherwise require relatively involved journeys. It also serves several inland towns and resorts which are not reached without troublesome changes in the ordinary way, and this train is perhaps as much appreciated for the special stage-to-stage facilities provided by it as it is for longer journeys. The fourth leaves York at 2.55 p.m. and runs *viâ* Leicester and Oxford to Winchester and Southampton; and the fifth is a through express from York at 10 p.m. to Bristol. Both of these provide very useful connections between the North Eastern system and the southern and south western counties.

In the opposite direction we have, first, the 9 a.m. service from Oxford to York. The second is the through express from Southampton *viâ* Winchester and Oxford to Woodford and Hinton, a peculiar service in that it only just enters upon Great Central territory to complete its journey. The third is the return Barry–Newcastle train. The fourth is the restaurant corridor express from Bournemouth to Bradford, Manchester and York. The fifth is the restaurant corridor express from Bristol and Bath to Huddersfield, Bradford and Manchester; and the series is completed by the 7.50 p.m. from Bristol to York. On Sundays there are through trains each way between Sheffield and Cardiff and Swansea.

Except for the through trains between London (Marylebone) and Huddersfield and Bradford (Lancashire and Yorkshire Railway), the slip service off the 3.15 p.m. *ex*-Marylebone for Edwinstowe, Ollerton, Lincoln, Grimsby and Cleethorpes and the Stratford-on-Avon through carriages from and to London (4.45 and 6.20 p.m. down and 8 a.m. up), all other arrangements apply



GREAT CENTRAL RAILWAY: TRAIN OF NEW STOCK AS USED FOR CROSS-COUNTRY AND MAIN LINE TRAINS.

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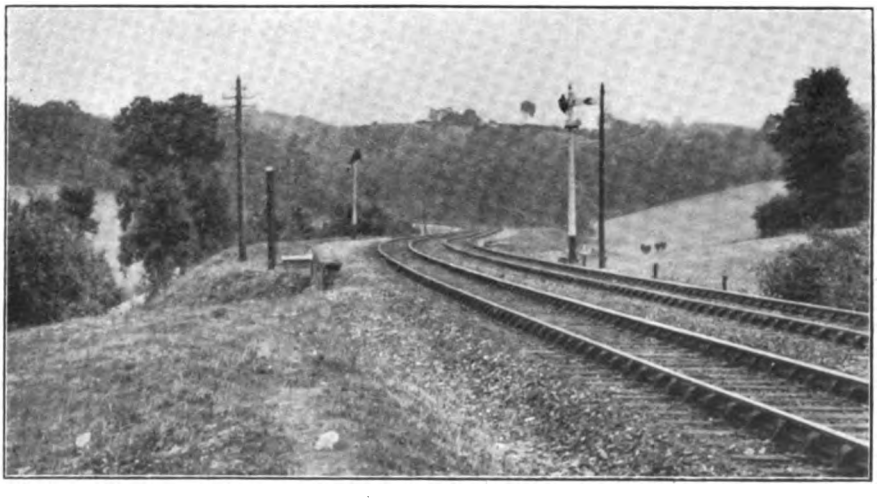
more to the older lines of the Manchester, Sheffield and Lincolnshire system.

Between Manchester and London (King's Cross) there are the 12.30 and 3.40 p.m. trains from London Road and the 10.55 p.m. from the Central station; and the corresponding return trains. From Liverpool there is the 2.30 p.m. "Duplex" Continental service, with through carriages for Grimsby in connection with the Great Central steamers, and for Harwich, to join the Great Eastern vessels. The latter vehicles incidentally serve various towns on the Great Eastern System. The 9.30 p.m. from Liverpool (Central) conveys through vehicles for Leicester and London, while several other trains, four of which serve Hull as well as the Cleethorpes route, run to Sheffield. From Manchester (Central) there are also the Continental services above mentioned, and through trains or vehicles for Hull at 9.25 and 11.25 a.m., and for Norwich and Yarmouth (Great Eastern Railway) at 11.25 a.m. Other services may be briefly reviewed. Cleethorpes and Grimsby have a through train for Wakefield at 3.20 p.m. From Lincoln there is a through train for Nottingham at 8.10 a.m. There are also numerous other through arrangements of a more local character. Sheffield is, for traffic purposes, the hub of the Great Central system, virtually all the through services passing through it; but Nottingham and Leicester are also comprehensive centres for connections and interchange facilities in association with the through trains.

A considerable proportion of the through trains include restaurant cars and corridor vehicles are the rule in the other cases. In some instances the vehicles used, or a share of them, belong to other companies, but as a rule Great Central stock is used, and for these modern vehicles of the latest class are now available. For the special services set trains of new stock have been recently introduced.

A PICTURESQUE VIEW ON AN IMPORTANT MAIN LINE. WHERE IS IT?



THIS VIEW, REPRODUCED FROM A PHOTOGRAPH SENT BY THE REV. JAMES DUNN, SHOWS A PORTION OF AN IMPORTANT MAIN LINE, ON A SECTION WHICH POSSESSES SPECIAL INTEREST IN REGARD TO LOCOMOTIVE WORK. READERS ARE INVITED TO SPECIFY THE RAILWAY AND LOCATION.

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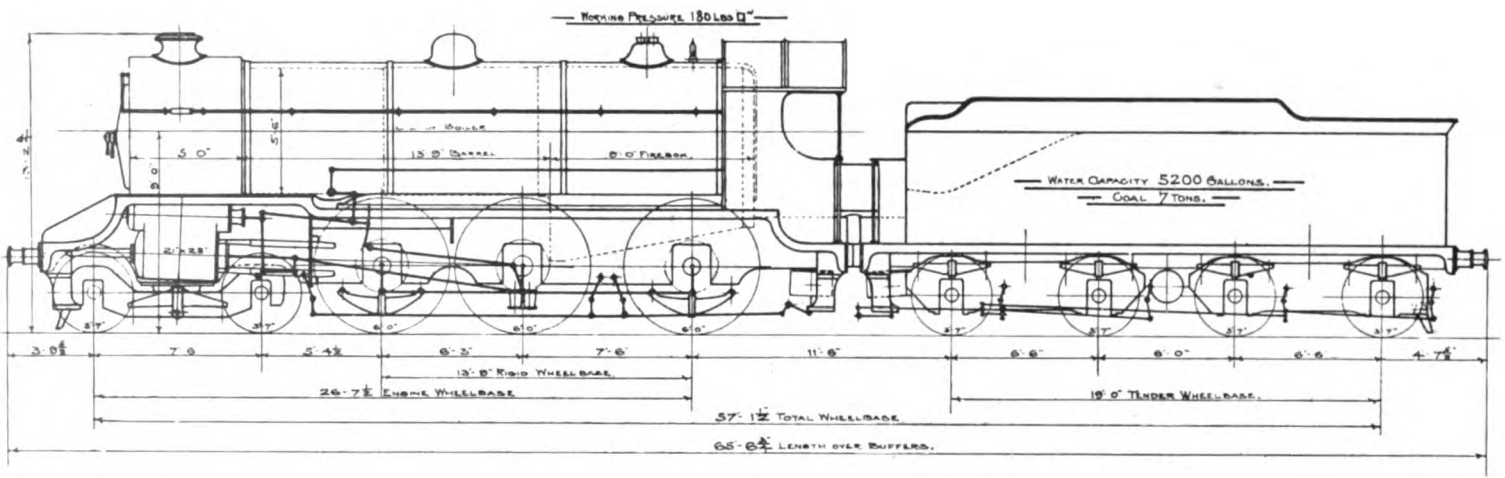
New 4-6-0 Mixed Traffic Locomotive: London and South Western Railway.

Designed by Mr. R. W. Urie, Chief Mechanical Engineer.



Mr. R. W. Urie, chief mechanical engineer, London and South Western Railway, is completing, at Eastleigh Locomotive Works, ten 4–6–0 locomotives for heavy excursion, express goods, and other traffic calling for considerable tractive power and moderately high speeds. The general features of the design are set forth above. Two cylinders only are employed, and fire-box water tubes are not included. Walschaert valve gear is, however, used. Of the ten engines Nos. 482–5 will have Schmidt superheaters, Nos. 486–9, Robinson superheaters, and Nos. 490–1 will use saturated steam. The respective heating surfaces will be as follows:—*Schmidt Superheater*: Small flue tubes, 1,252 sq. ft.; large flue tubes, 507 sq. ft.; firebox, 167 sq. ft.; total water surface, 1,926 sq. ft.; superheater, 394 sq. ft.; total, 2,320 sq. ft. *Robinson Superheater*: Small flue tubes, 1,252 sq. ft.; large flue tubes, 464 sq. ft.; firebox, 167 sq. ft.; total water surface, 1,883 sq. ft.; superheater, 371 sq. ft.; total, 2,254 sq. ft. *Saturated Steam*: Tubes, 2,025 sq. ft.; firebox, 167 sq. ft.; total, 2,192 sq. ft. The grate area is 30 sq. ft.; working pressure, 180 lb. per sq. in.; cylinders, 21 in by 28 in.; bogie wheels, 3 ft. 7 in. diam.; coupled wheels, 6 ft. diam.; boiler barrel, 5 ft. 6 in. diam. at smallest ring, 13 ft. 9 in. long; firebox, 9 ft. long; engine wheelbase, 26 ft. 7½ in.; coupled wheelbase, 13 ft. 9 in. The tender is carried on 3 ft. 7 in. wheels over a wheelbase of 19 ft.; and holds 5,200 gals. of water and 7 tons of coal. Total length of engine and tender over buffers, 65 ft. 6¾ in.

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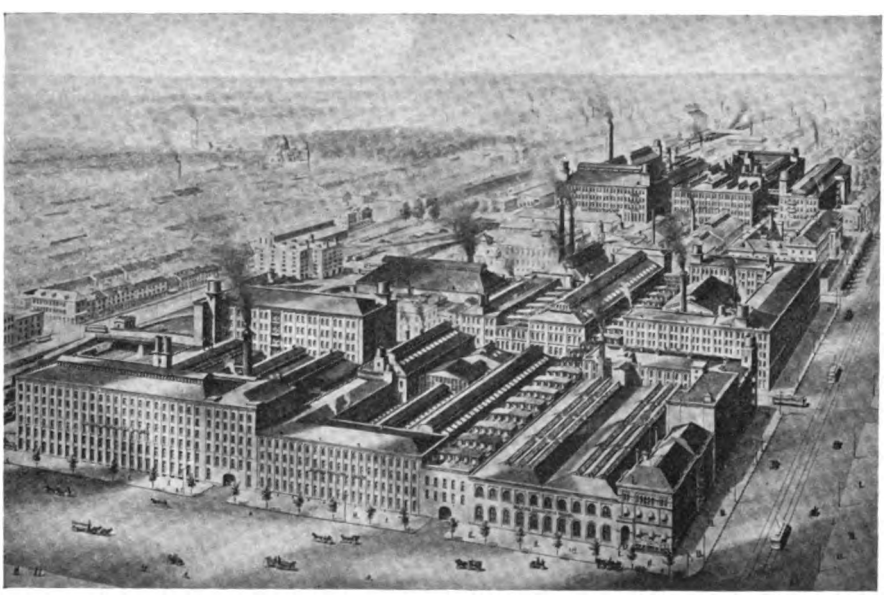
The Baldwin Locomotive Works.

BY AN ENGINEERING CORRESPONDENT.

AMONG the locomotive building plants in the United States, The Baldwin Locomotive Works has attained special prominence because of the quality of its production, its unusual capacity, and the distribution of its products to virtually all parts of the world where railways have been built. Founded at a time when the railway industry was in its infancy, and when the locomotive builder, with practically no previous experience to guide him, had to work almost entirely on his own initiative, the plant has steadily grown, and its facilities have kept pace with the increasing demand for railroad motive power. Thirty years were required for the completion of the first thousand locomotives, but the annual capacity of the plant is now 2½ times that number; and in July, 1913, the forty-thousandth locomotive was completed—a truly notable achievement.

A brief outline of the history of The Baldwin Locomotive Works will serve to explain the present standing of the Works, as well as the active part played by the company in promoting locomotive development during the past 82 years. The experience of Matthias W. Baldwin, the founder of the Works, as a locomotive builder, began in 1831, when he was called upon to construct a small working model for exhibition in the Philadelphia Museum. Such was the success of this little machine that Mr. Baldwin, in the same year, received an order for a locomotive from the Philadelphia, Germantown



BIRD'S-EYE VIEW OF PHILADELPHIA PLANT.

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OFFICES AND WORKS, PHILADELPHIA PLANT.

and Norristown Railroad. The line was 6 miles in length, and was operated by horse-power. An idea of the difficulties encountered in building this engine may be gained from the fact that, although ordered in 1831, it was not completed until November 23, 1832. Lack of experienced workmen and suitable tools made the task of building "Old Ironsides"—so the locomotive was christened—truly herculean. So great were the difficulties and discouragements that Mr. Baldwin emphatically remarked, after the engine was completed, "That is our last locomotive."

By this time, however, the steam locomotive had proved itself a practical machine. The result was a decided impetus to railway construction, and consequently an increasing demand for motive power. In spite of the discouragements encountered in building "Old Ironsides," the locomotive had become an object of peculiar interest and fascination to Mr. Baldwin; and by the time he received an order for a second, he had planned a number of valuable improvements which were embodied in its construction. This engine was built for the Charleston and Hamburg Railroad Company of South Carolina. It had a single pair of driving-wheels with a four-wheeled leading truck, and was the first of a type, which, for the succeeding six or eight years, proved highly satisfactory in both freight and passenger service.

The export trade of The Baldwin Locomotive Works was of early origin. It began in 1838, when three locomotives were shipped to Cuba. In 1840, an order was received for a locomotive for Austria; and in 1845, three engines were built for the Royal Railroad Company of Wurtemberg. The products of the Works thus had an early entry into Europe.

Locomotives with a single pair of driving wheels soon proved inadequate to handle the increasing volume of business on the railways; and in 1842 Mr. Baldwin introduced his "flexible beam truck" locomotives, with three pairs of coupled wheels, two pairs of which were so arranged as to have a limited amount of lateral motion, thus permitting the engine to traverse sharp curves with ease. Subsequently these locomotives were increased in size, and a fourth pair of driving-wheels added. The flexibility secured in the design fitted it specially for the uneven tracks and sharp curves which characterised the railways of that period; and largely for this reason, these engines proved extremely popular. This feature of flexibility, attained in present practice by the use of swivelling trucks under one or both ends of the locomotive, and by suspending the frames from

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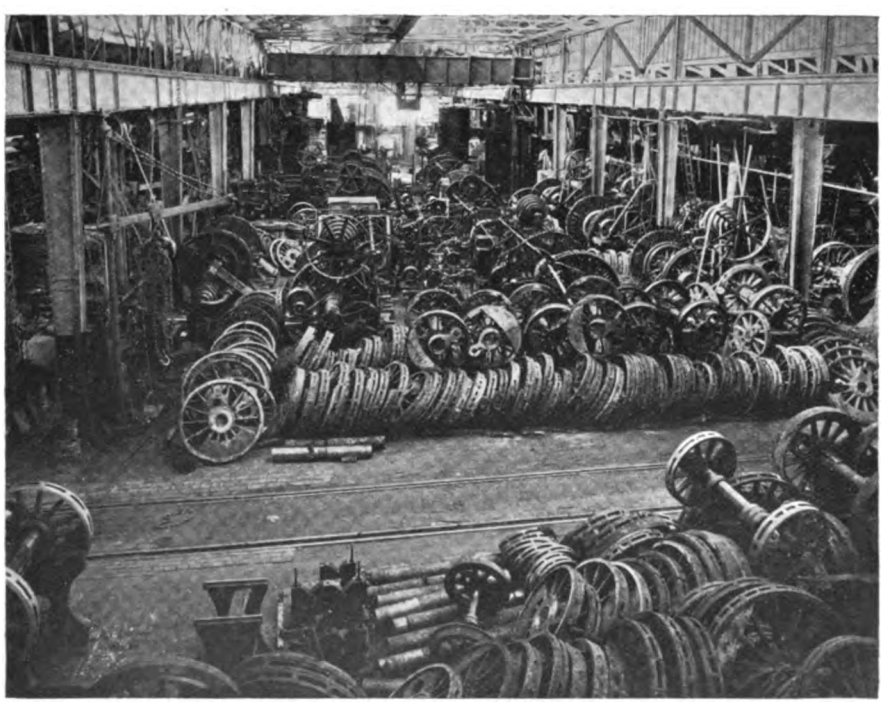
the fulcrums of equalising beams connecting the springs, has always characterised American construction. It has been one of the chief reasons for the success of American locomotives in newly-developed countries, where railway tracks are seldom maintained in first-class condition.

Fifty years ago—at the time of America's Civil War—the locomotive had developed to a point where the most advanced designs included several prominent features which are to-day characteristic of American practice. Among these features were bar frames, outside cylinders placed horizontally, each cast in one piece with a half saddle supporting the smoke-box, and a design of boiler which, while relatively small and of low power, had many features in common with the boilers used to-day. An interesting event immediately subsequent to the Civil War was the building of the locomotive *Consolidation* for the Lehigh Valley Railroad. This engine was constructed by The Baldwin Locomotive Works in 1866. With four pairs of driving wheels and a two-wheeled leading truck, it established a type which achieved great success in heavy freight traffic in the United States, and which has been extensively built for export, in various weights and sizes, for both broad and narrow gauge.

For nearly 30 years subsequent to the building of the *Consolidation*, comparatively few radically new types of locomotives were produced, although there was a steady increase in the size and capacity of locomotives for all classes of service. In 1872, the export field was extended to include Russia and Finland, and in 1877 the first Baldwin engines were shipped to Australia and New Zealand. In 1885 a "Decapod" (ten-coupled) locomotive of unusual size for that time, was built for the Dom Pedro Second Railway of Brazil. Another event of special moment occurred in 1887, when the first Baldwin engines were exported to Japan.

During this period service requirements on American railways were constantly becoming more severe, because of increasing train loads and higher speeds. In 1893, at



WHEEL LATHE SHOP, PHILADELPHIA PLANT.

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FRAME SHOP, PHILADELPHIA PLANT.

the Columbian Exposition, The Baldwin Locomotive Works exhibited a fast passenger locomotive of the 2–4–2 type, in which the firebox was placed back of the rear driving axle and over the trailing wheels. This idea was further developed in some locomotives built for the Atlantic Coast line in 1895. In these engines a four-wheeled leading truck was applied, and they became known as the "Atlantic" type. This design provided a deep firebox, with ample grate area and furnace volume; and increased the steaming capacity in proportion to the adhesion of the locomotive, thus allowing greater horse-power to be developed. The same principle of construction was subsequently applied to other locomotive designs; and to-day the two prominent types, for passenger and freight service respectively, are the "Pacific" (4–6–2) and the "Mikado" (2–8–2), in each of which the wide, deep firebox is used.

American locomotive construction at the present time is characterised chiefly by the use of wheel-loads as heavy as can be safely employed, and by the application of special devices for the purpose of rendering the engine more efficient. Among these super-heaters and brick arches deserve mention. For constructive reasons, the valve gear is generally fitted outside, the Walschaert motion being usually employed. This places the mechanism where it can be easily inspected and lubricated, and allows room between the frames for a substantial system of cross-bracing—a most important feature in engines having large cylinders and carrying high pressures. At the same time those features of simplicity and flexibility which have always characterised American locomotive design are being retained as far as possible in the large units now being built.

Before describing the plant as it exists to-day, brief reference should be made to the fact that up to July 1, 1909, The Baldwin Locomotive Works was organised as a co-partnership; and in this respect it was unique among large American manufacturing establishments. On the date mentioned, a stock company with the name of "Baldwin Locomotive Works" was incorporated under the laws of the State of Pennsylvania. Two years later there was a second reorganisation, and a public joint stock company, known as "The Baldwin Locomotive Works," was organized and capitalized at $40,000,000 ($20,000,000 cumulative preferred stock and $20,000.000 common stock). This stock is

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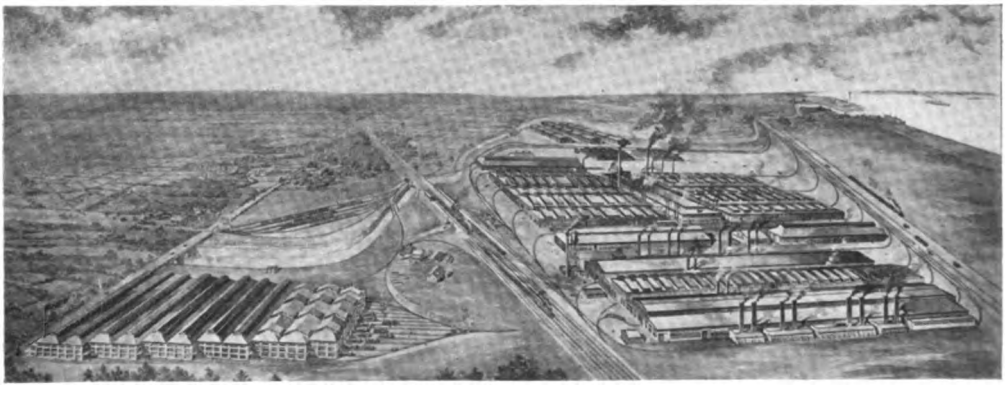
listed on the Philadelphia and New York Exchanges.

Philadelphia has always been the home of The Baldwin Locomotive Works, and after 82 years of continuous operation, the offices, drawing rooms and principal plant are still located in that city. It was in 1835 that a new shop, erected on part of the site of the present works, was completed and occupied by Mr. Baldwin. There was at that time room for expansion in the immediate neighbourhood. As the business grew, adjoining land was acquired, and new shops erected. In 1873, the shops of the Norris Locomotive Works, lying a short distance to the West of the Baldwin Works, were purchased, and became a part of the plant. With the city constantly growing up around the Works, however, indefinite expansion in the immediate neighbourhood became impossible. Accordingly, in 1906, a large tract was purchased at Eddystone, Pa., about 12 miles from the city; and in 1911 a further purchase of 370 acres was made at East Chicago, Indiana, in the middle West. Shops will be erected on this site as soon as the further growth of the business warrants such expansion.

In this connection, mention should be made of the Standard Steel Works, whose plant is located at Burnham, Mifflin County, Penna. The Baldwin Locomotive Works acquired a controlling interest in the Standard Steel Works in 1875, and from that time onward the importance of the latter as a manufacturing plant has steadily increased, while its capacity has been greatly enlarged. The products of the Standard Steel Works include tyres, steel-tyred and rolled-steel wheels, iron and steel forgings and castings, railway springs, steel crusher rings and other miscellaneous articles. Previous to the purchase of the Eddystone tract, the Philadelphia plant of The Baldwin Locomotive Works constituted a complete locomotive building establishment, having a large iron foundry, heavy hammer shop, smith shops and machine and finishing shops. With the acquisition of the Eddystone tract, and the enlargement of the Standard Steel Works, the most logical plan for providing for future expansion was to utilize the Philadelphia plant as machine and finishing shops, transferring the heavier work to out-of-town localities. Accordingly, a heavy hammer shop for making locomotive forgings was built at the Standard Steel Works, and iron foundries and smith shops were established at Eddystone. This removed from the city the shops which were most objectionable on account of smoke and noise, leaving room in Philadelphia for additional machine shops.

The Philadelphia plant now covers an area of 17·25 acres, the greater part of which is under roof. Varying in height from one to six stories, the buildings are of brick, and of modern mill construction. Immediately adjacent to this plant are the executive offices and draughting rooms. The draughting department is an extensive organisation in itself, the staff numbering about 450. This large force is required because of the great



BIRD'S-EYE VIEW OF EDDYSTONE PLANT.

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INTERIOR OF FOUNDRY, EDDYSTONE PLANT.

variety of locomotive designs which must be produced. In former days, when American railroads were not so particular in specifying their locomotive requirements as they are to-day, the engines of each builder had certain features which rendered them different from those of other makers. A Baldwin engine was easily distinguished from a Rogers or a Schenectady engine, and each builder could offer a series of locomotives constructed to his standards, from which the railroad company could easily make a suitable selection. At present, however, there are not only a large number of different types of locomotives in service, but also many modifications of each type. Furthermore, the principal railway systems usually prepare their own specifications, and not infrequently furnish a complete set of drawings to which the locomotives are to be built. This naturally complicates the work of the contract shop. It is not uncommon to find in the erecting shop of The Baldwin Locomotive Works two engines of the same type and approximately the same capacity, but having no interchangeable detail parts, each being built to specifications furnished by its respective purchaser.

An important phase of the work preliminary to the actual construction of the locomotive is the testing of materials. The Department of Tests of The Baldwin Locomotive Works maintains well-equipped chemical and physical laboratories, where samples of boiler and firebox plate, bar iron and steel, pig iron, special composition metals and the various other materials entering into locomotive construction, are subjected to rigid tests. An important feature of the work of this department is the analysing of fuels preparatory to designing the locomotives which are to use them. Cases are on record where railway companies have sent in samples of low grade fuels which were considered hardly fit for steam generating purposes, but which were found, after analysis, to be available for use in specially designed boilers. Locomotives so constructed have, as a rule, proved successful and economical in service.

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Reference has been made to the fact that the Philadelphia plant contains principally machine shops. Upwards of 3,000 machine tools are in use, many of them specially designed for locomotive work. Electric motors play an important part in the operation of these shops. Virtually all the large tools, such as cylinder boring mills, frame planers and slotters, wheel lathes, and heavy machines of miscellaneous types, are driven by individual motors. This not only provides an exceedingly flexible and economical arrangement of drive, but also allows overhead room for travelling cranes, which are extensively employed. These cranes range in capacity from 1 to 100 tons each, the majority being driven by electric power.

The boiler shop is one of the largest in this plant, as the greater part of the boiler work is done at Philadelphia. Plates are received from the mills, cut to nearly the size required, a small margin being left for trimming. The rivet and stay-bolt holes are then located according to the boiler drawing, after which the plates are drilled, trimmed to size, bent or flanged if necessary, and finally assembled. Various machines in the shop, such as drills, planers and bending rolls, are specially designed for the work, and driven by individual motors. After the plates have been assembled, the rivet holes are reamed to size by portable pneumatic machines, and the stay-bolt holes threaded by tapping machines, which are also pneumatically operated. Riveting is done, wherever possible, by hydraulic power, although a certain amount of hand work is unavoidable in those parts of the boiler which are inaccessible to the power riveter. Tubes are inserted and the hydrostatic and steam tests applied after the boiler has been received in the erecting shop.

It is the universal practice in America to use steel for inside firebox shells, but not infrequently locomotives for export have fireboxes of copper, and the shops are thoroughly familiar with the use of this material. Boiler and firebox plates that require flanging are, as far as possible, shaped on hydraulic presses. In some cases, however, hand-flanging must be used, because of the great variety in the types and sizes of boilers. In a railroad shop, a comparatively small number of dies will suffice for flanging boiler and firebox plates; but in a large contract shop, where single engines of special design are constantly under construction, it would be impracticable to make a sufficient number of dies to flange all the plates on the press. The hand work is done with heavy mallets, and several heats are usually required before an entire flange can be completed. It is the regular practice in this shop to weld the ends of longitudinal boiler seams. This is done either by the oxy-acetylene welding process, or with specially designed pneumatic hammers. By welding the seam in this way, it is not necessary to run the outside welt strip under the next adjacent ring. The result is a stronger and more

ERECTING SHOP, EDDYSTONE PLANT.

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INTERIOR OF ERECTING SHOP, EDDYSTONE PLANT.

perfectly formed joint than can be secured when the seam is not welded.

The employment of bar frames is universal in American locomotive practice, and in the majority of instances these frames are of cast steel, purchased, in the rough, from outside manufacturers, as no steel foundry is included in the Baldwin plant. Finishing of the frames is done principally on planers and slotters, the planers being of sufficient size to take two frames, which are laid on the table side by side. The largest of these frames approximate 30 ft. in length, and the machine has sufficient stroke to make a continuous cut from one end of the frame to the other. The planer finishes the frames on the top and sides; the inside faces of the pedestals and frame rails are finished for fitting purposes where necessary; and this work is done on specially designed slotting machines. Of these the largest consist of four machines mounted on one bed, and where a number of frames are being worked alike, several can be piled one above the other, and finished simultaneously. Each section of the machine has an individual motor drive. Hence the greatest possible flexibility and power economy are obtained. Before the frames are sent to the erecting shops, the necessary holes are drilled for bolting other parts to them. This work is completed on multiple spindle drills, the holes being laid off to gauges to insure interchangeability.

Of the remaining shops, such as the wheel shop, cylinder shop and connecting-rod shop, the equipment is fitted for handling the heaviest as well as the lightest class of locomotive work. Locomotive tenders are built complete in modern structures located on the side of the old Norris Works. Adjoining this plant is a shop specially fitted for the manufacture of electric motor and trailer trucks, which constitute an important item in the product of the Works.

The erecting shop at Philadelphia is one of the largest in the plant. It contains 19 tracks, two of which lead out of the Works, and make connection with the Philadelphia and Reading Railway, over which all incoming and outgoing material is handled. The shop is divided into two bays, each of which is spanned by one 50-ton and one 100-ton electric travelling crane. Until within the last few years, this shop was capable of handling the largest engines built; but with the advent of heavy locomotives of the "Mallet" type it became inadequate, and larger locomotives are now erected at Eddystone, in a new shop which is later described. The Philadelphia shop is used for the

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erection of lighter locomotives, as well as foreign engines, which are here assembled complete, and subsequently stripped and packed before shipment.

A feature of the Philadelphia plant is the fire-fighting equipment. A well-trained fire department is maintained among the employés, and the buildings are supplied with automatic fire-alarm and sprinkler systems. Tracings and valuable papers are stored in fire-proof vaults adjoining the main offices.

The Eddystone plant is established on a tract of 225 acres, on the shore of the Delaware River, about 12 miles from Philadelphia, and near the manufacturing town of Chester. Railroad facilities are unusually good, as the plant has direct track connection with the Pennsylvania Railroad, the Baltimore and Ohio Railroad, and the Chester branch of the Philadelphia and Reading Railway; while docking facilities along the river front can, if desired, be installed in the future.

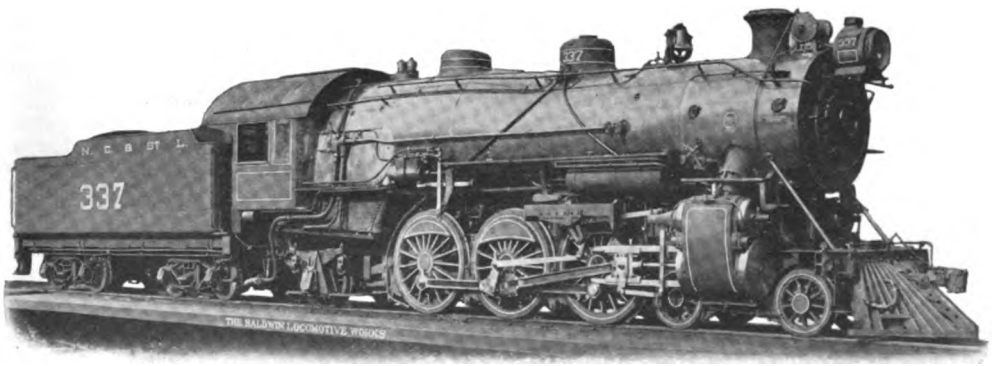
The principal buildings comprising this plant are the following:—

Iron foundry, 900 ft. by 312 ft.
Two smith shops, each 400 ft. by 283 ft.
Erecting shop, 880 ft. by 480 ft.
Spring and rivet shop, 400 ft. by 50 ft.
Power house, 283 ft. by 150 ft.
Two pattern shops, each 175 ft. by 156 ft.
Four large pattern storage houses.

There are in addition various smaller shops and buildings. These shops are comparatively new structures, one storey in height, the larger buildings being of fire-proof construction with steel frames, hollow terra-cotta tile walls, and cement tile roofs. Ample window space insures abundant light. With the large amount of space available, the buildings are so located that material can be handled with a minimum of delay and inconvenience. All the shops have standard gauge track connections with the railways mentioned, and the plant also contains a 2-ft. gauge industrial railway, which has proved indispensable for transferring material and removing ashes and other refuse. A complete equipment of locomotives and rolling stock, both standard and narrow gauge, is in service.

A special feature of the work in the Eddystone foundry is the care taken to produce different grades of iron, in order to obtain material best suited to the work required of the various parts. For example, one grade of iron is used for cylinders, another for hollow castings which, like steam pipes, must be kept steam-tight, another for parts whose surfaces are subject to wear, and another for miscellaneous castings. Each of the several departments of the foundry is equipped with its own core ovens and cupolas. The castings are poured in the afternoon, and during the night are sent to a separate building where they are cleaned, chipped and inspected preparatory to being sent back to Philadelphia for finishing. Much of the cleaning is done by compressed air, which is very effective in blowing out the steam and exhaust passages of cylinder castings and doing other work of a similar nature. The castings are then shipped to Philadelphia, to be machined and finished. With the excellent railway facilities between the two plants, this is effected without difficulty.

The two smith shops are designated "East" and "West" respectively. The east shop is at present largely used for storage purposes. It contains a number of automatic bolt-making machines, as well as a large hydraulic press, used principally for boiler work. A specialty here is the manufacture of steam domes, which are flanged from a single piece of $1\frac{1}{8}$-in. plate. This process has been so



PACIFIC TYPE PASSENGER LOCOMOTIVE: NASHVILLE, CHATTANOOGA AND ST. LOUIS RAILWAY.

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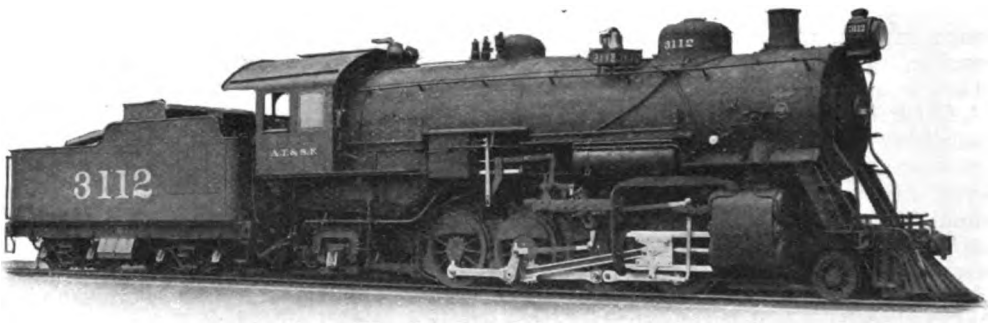

MIKADO TYPE FREIGHT LOCOMOTIVE, ATCHISON, TOPEKA AND SANTA FE RAILWAY.

developed that domes 26 in. in height are produced. In no case is the thickness of the metal permitted to be reduced to less than $\frac{3}{4}$ in., and with the dome heights generally used it is not reduced to less than 1 in. Low domes, used on large boilers, are formed in two heats ; but for higher domes, a greater number of heats is necessary. The plates are heated in an oil furnace, located adjacent to the press. They are hauled out by means of a cable, which is wound on a drum rotated by an electric motor, so that a minimum amount of manual labour is required.

The west shop is fully equipped with special machines, including steam hammers and small hydraulic forging presses. The latter have largely replaced hand work in bending angle irons and plates, and in performing operations which require the production of a large number of duplicate parts. The spring and rivet shop contains a number of automatic machines for the manufacture of rivets of small diameter. These machines are driven by individual electric motors. A coil of wire of the proper diameter being fed into the machine, the rivets are cut off and the heads formed on them while the metal is cold.

In many respects the erecting shop is the most unique of the various buildings at Eddystone. It covers an area of 7·59 acres, and has a length of 880 ft. The width of the building is increased in five steps, and it varies from 240 ft. to 480 ft. Ten tracks lead into the shop at the narrow end, and at each increase in width two additional tracks enter the building, one on each side. The cranes run transversely of the shop, and the equipment in this respect is unusually complete. Cars containing material are run in at the sides, and as the building may be entered at various points, the material can be delivered where it is wanted without conflicting with cars that are being unloaded in other parts of the shop.

With such a large number of tracks leading out of the structure, a locomotive can be erected on the track on which it is to be removed. As the process of assembling progresses, the locomotives are moved forward, to be finally fired up and tested outside the building. Those sections of the shop devoted to pipe bending, boiler work, superheater fitting and other special operations are conveniently located with reference to the erecting tracks, so that the work may be prosecuted with a minimum amount of congestion and delay. This shop, as far as its general lay-out and its facilities are concerned, has a liberal margin for meeting future growth in the size and weight of locomotives Expansion in business can be readily cared for by enlarging the facilities at Eddystone and East Chicago.

Accompanying illustrations show two locomotives recently built by The Baldwin Locomotive Works, and typical of present practice for passenger and freight service respectively. The heaviest passenger trains now weigh from 600 tons to 800 tons exclusive of engine and tender. To haul a train of this weight at an average speed of from 40 to 50 miles per hour, requires a locomotive having two leading characteristics—first, ample weight on driving wheels, so that a high starting tractive force can be developed ; second, sufficient steaming capacity to develop large horse-power, so that high speeds may be maintained. These qualities are combined, to an admirable degree, in the " Pacific " or 4–6–2 type, which is now more generally used than any other for heavy express service.

Locomotive No. 337, for the Nashville, Chattanooga and St. Louis Railway, is an

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excellent representative of an engine designed for heavy, fast service, and a study of its dimensions shows how well it is fitted for work of this character. Locomotive No. 3112, for the Atchison, Topeka and Santa Fe Railway, is of the "Mikado" type, and used in heavy freight service. The trailing truck here serves the same purpose that it does in the "Pacific" type locomotive, in that it permits the use of a wide and deep firebox, which is placed back of the driving-wheels. The additional weight involved by this form of construction is carried on the trailing wheels. Large steaming capacity afforded by this construction is of special value where the service requirements are unusually severe, or where inferior grades of fuel must be used. Like the "Pacific" type, the "Mikado" type locomotive illustrated is equipped with a fire brick arch and Schmidt superheater. Locomotives of this type are now in service on many of the principal American roads. On level divisions they are successfully hauling loads exceeding 4,000 tons in weight, while under specially favourable conditions, trains of considerably greater weight have been hauled.

Leading dimensions of these two engines are given below :—

	N.C. & S.L.R.	A.T. & S.F.R.
Cylinders ..	25. in × 28 in.	25 in. × 32 in.
Valves, piston	15 in. diam.	16 in. diam.
Boiler :		
Type ..	Wagon-top	Wagon-top
Material	Steel	—
Diameter	6 ft. 4 in.	6 ft. 6¾ in.
Thickness of sheets	11/16, 3/8 & 7/16 ins.	7/16 in. & 15/16 in.
Staying ..	Radial	Radial
Working Pressure .	180 lbs.	170 lbs.
Fuel ..	Soft Coal	Soft Coal
Firebox :		
Material	Steel	Steel
Length ..	9 ft. 6⅛ in.	9 ft.
Width ..	7 ft. 0¼ in.	6 ft. 6 in.
Depth, front	7 ft. 1¼ in.	7 ft. 2¼ in.
,, back	6 ft. 4½ in.	6 ft. 4¼ in.
Thickness of Sheets :		
Sides ..	3/8 in.	3/8 in.
Back ..	5/16 in.	5/16 in.
Crown ..	3/8 in.	5/16 in.
Tube ..	½ in.	9/16 in.
Water Space :		
Front ..	5 in.	5 in.
Sides ..	5 in.	4½ in.
Back ..	5 in.	4½ in.
Tubes :		
Diameter	5⅜ in. & 2 in.	5½ in & 2¼ in.
Material	5⅜ in., steel 2 in., iron	5½ in. iron 2¼ in., iron
Thickness	5⅜ in., No. 9. w.g. 2 in., No. 11. w.g.	5½ in., No. 9. w.g. 2¼ in., No. 11. w.g.
Number..	5⅜ in., 34 2 in. 241	5½ in., 36 2¼ in. 240
Length ..	20 ft. 6 in.	20 ft.

	N.C. & S.L.R.	A.T. & S.F.R.
Heating Surface :		
Firebox..	241 sq. ft.	237 sq. ft.
Tubes ..	3,553 sq. ft.	3,849 sq. ft.
Firebrick tubes .	29 sq. ft.	25 sq. ft.
Total ..	3,823 sq. ft.	4,111 sq. ft.
SuperheatingSurface	842 sq. ft.	880 sq. ft.
Grate Area ..	66·7 sq. ft.	58·5 sq. ft.
Driving wheels :		
Diameter, outside	6 ft.	4 ft. 9 in.
,, Centre..	5 ft. 4 in.	4 ft. 2 in.
Journals, main..	10 in. × 12 in.	11 in. × 12 in.
,, others .	9½ in. × 12 in.	10 in. × 12 in.
Engine Track Wheels :		
Diameter, front .	3 ft. 1 in.	2 ft. 5¼ in.
Journals ..	6 in. × 12 in.	6½ in. × 10½ in.
Diameter, back .	3 ft. 8 in.	3 ft. 4 in.
Journals ..	8 in. × 14 in.	8 in. × 14 in.
Wheelbase :		
Driving.. ..	13 ft.	16 ft.
Rigid	13 ft.	16 ft.
Total engine ..	34 ft. 1 in.	34 ft. 1 in.
Engine & tender	68 ft. 3½ in.	66 ft. ¼ in.
Weight :		
On driving wheels	74 tons	97·9 tons
Total engine ..	116 tons	126·7 tons
Total engine and tender, ..	about 185½ tons	203 tons.
Tender :		
Wheels, diameter	3 ft.	2 ft. 10½ in.
Journals ..	5½ in. × 10 in.	5½ in. × 10 in.
Tank capacity ..	8,500 galls.	8,500 galls.
Fuel capacity ..	14 tons	12 tons.

The following interesting facts regarding the organisation of the Baldwin Locomotive Works may be added :—

Number of men employed	19,000
Hours of labour, per man per day ..	10
Principal departments run continuously, hours per day	23
Horse-power employed—	
Steam engines	14,890
Oil engines	4,850
Number of buildings comprised in the Works	85
Acreage comprised in the Works—	
Philadelphia	17·25
Eddystone	225·59
Acreage of floor space comprised in buildings	64·1
Horse-power of electric motors employed for power transmission, aggregate..	27,624
Number of electric lamps in service—	
Incandescent	8,900
Arc	1,590
Number of electric motors in service ..	2,355
Consumption of coal, in net tons, per week, about	3,850
Consumption of fuel oil, in gallons, per week, about	125,000
Consumption of iron and steel, in net tons, per week, about	6,000
Consumption of other materials, in net tons, per week, about	2,500

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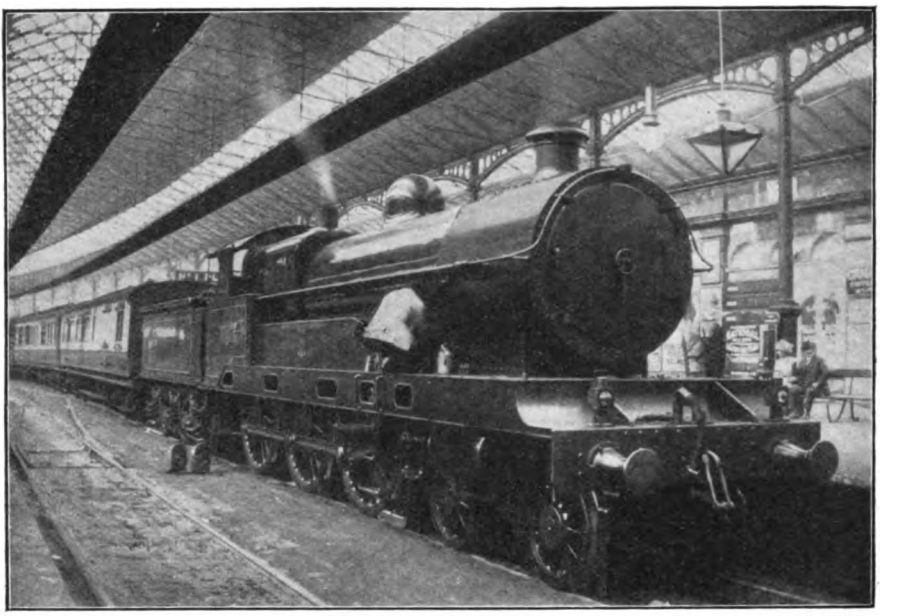

Photo] [H. G. Cogger.

LONDON AND NORTH WESTERN RAILWAY.

11 a.m. *ex*-Liverpool Express at Euston (load, 416 tons). Four-cylinder locomotive No. 1327, *Alfred Fletcher.*

British Locomotive Practice and Performance.

By CECIL J. ALLEN.

ON more than one occasion I have been asked by readers to devote a little attention to the question of train loads and the estimation of tonnage, and it is my purpose, therefore, to address a few remarks to this question. The methods of train estimation in force on various lines are, as every reader will know, of considerable variety. Generally speaking, they are three in number, trains being reckoned up either, first, as so many vehicles; second, as so many axles; or third, in actual tonnage. In these days, when the weight of coaches is so greatly on the increase, and there are, in consequence, vehicles in use which vary so considerably in weight for the same wheel arrangement, obviously the only method with any pretension to accuracy—for purposes of comparison or estimation—is that of actual tonnage. It is essential that the trains should be "reckoned" in some way, in order that those concerned with the working of the traffic should know whether division of a train is desirable, or whether the provision of a pilot locomotive is necessary, and also that the driver may have some indication of the work before him.

Probably the earliest and the most widely used of these methods is that of counting the vehicles, and there is great divergence in the units adopted. An eight-wheeled bogie coach on the Southern lines is reckoned as "= 2," whereas North of London its value is only "= 1½." Consequently the train of 10 eight-wheelers and 2 six-wheelers mentioned in the last issue as timed on the South Eastern and Chatham Railway would be reckoned on that system as 22 vehicles, whereas on the London and North Western Railway they would only be counted as a load of "17." On the Great Eastern Railway, again, a set of three dining cars, even if all eight-wheeled coaches, is reckoned as six vehicles. Consequently the "Norfolk Coast Express" of that company, with twelve eight-wheelers attached, would count on the Great Eastern Railway as 19½ coaches, on

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the London and North Western Railway as 18, and on the South Eastern and Chatham Railway as 24 vehicles. Twelve-wheeled dining cars are reckoned on the London and North Western Railway as " = 2 " in each case, but twelve-wheeled cars on some other lines, as the Great Central, are valued at " = 2½." Again, on many lines four-wheeled vehicles are denominated as " = 1 " in the same way as six-wheeled, whereas on the Great Eastern Railway, a four-wheeled suburban coach is reckoned as " = ¾," and a four-wheeled horse-box or carriage truck as " = ⅔ "; that is to say 3 of the latter are taken to equal 2 six-wheelers, and 4 of the former to equal 3 six-wheelers. Thus this method of loaded, say, to ten 57 ft. corridor eight-wheelers and three 65 ft. 6 in. twelve-wheeled dining cars, and weighing empty about 420 tons, would be reckoned in coaches as equal to a train of fourteen 42 ft. eight-wheelers, not weighing more than 310 tons at most when empty. Each train would officially be denominated as " = 21," and for each, according to regulations, a " Precursor " should take a pilot; in the former case this might be really necessary, whereas in the latter case such a train would, of course, lie easily within the engine's unpiloted hauling capacity. Thus on any one line the reckoning of vehicles conveys but little meaning so far as weight is concerned, while, when it is remembered that on the Southern

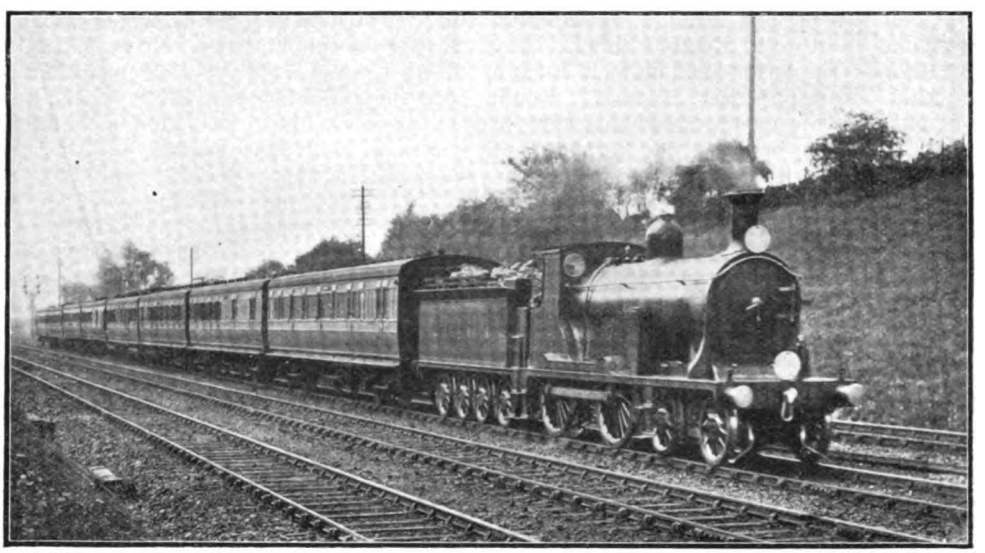

Photo [*F. E. Mackay.*

LONDON AND SOUTH WESTERN RAILWAY.

Down West of England Express. 4–4–0 locomotive No. 121.

computation is subject to a considerable amount of variation.

Such variation would, however, be of less moment were it not that any one set of units in itself is well-nigh valueless as a basis of accurate comparison. For instance, on the London and North Western Railway an old 42 ft. eight-wheeled coach weighing, say, 22 tons, has the same denomination as a modern 57 ft. corridor vehicle weighing nearly 30 tons, while a 65 ft. 6 in. dining car, with a weight of 43 tons, or all but twice as much, is only reckoned at " = 2," or of 33⅓ per cent. greater weight. Taking an extreme case, therefore, we should find that such an express as the 10.30 a.m. *ex*-Euston, lines, with early types of coaches, a load of " = 21 " might not represent much more than 210 tons, this method of computation appears almost ludicrous. Many readers, as they peruse these lines, will be reminded of the late Mr. C. Rous-Marten's almost invariable custom, when he recorded an exceptionally heavy load—say 450 tons—of dividing it by 10 and remarking that such a train would be reckoned as " equal to 45 coaches on the Southern lines " !

The method of reckoning train loads in axles, also widely practised, is equally open to criticism. A modern Great Western 70 ft. corridor coach, for instance, has 4 axles, and averages in weight 34 tons empty, or 8½ tons

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per axle. On the same line a horse-box, with 2 axles, weighs empty about 6 tons, or 3 tons per axle. An early eight-wheeled coach turns the scale at about 20 tons, or 5 tons per axle. Consequently a train of ten 70 ft. corridor eight-wheelers, including restaurant car, would weigh empty 343 tons, and be reckoned as 40 axles, whereas it would need something over 46 horse-boxes, or 92 axles, to make up the same weight, or 17 non-corridor coaches, having 68 axles. On the Great Eastern Railway the limit load for an engine of the "Claud Hamilton" type is, I believe, 57 axles unpiloted, but whereas this might on the one hand consist of 19 six-wheelers, weighing only 285 tons, it might, on the other hand, be made up of twelve 50 ft. corridor coaches, a twelve-wheeled dining car, and a six-wheeler, weighing in all quite 370 tons empty. Any excess over the latter load, on such a train as the "Norfolk Coast Express" would obviously entitle an engine of this type to pilot assistance, whereas the former load could be dealt with comparatively easily on any train. Certainly, then, the second method of computation has no more to commend it than the first, and is unreliable.

Indeed, from the point of view of accurate comparison, it is only the tonnage method that is of real value. That this is now being realised more generally is evidenced by the increasing number of companies now adopting this method of computation, the latest among these being the London and North Western Railway. There is this disadvantage, that it is more difficult to walk the length of a train reading the exact tonnage from each coach, than it is to reckon up the train in axles or vehicles at a glance, but the small trouble thereby involved is more than counterbalanced by the accuracy of results. For the purpose of computation the railways using this method now mark the tare of each coach legibly on the vehicle. On the Great Western Railway the weight is painted on the frame, just above the footboard, at the extreme end of the coach. The same practice is in vogue on the East Coast Railways—the Great Northern, North Eastern and North British—the weight being either painted on, or shown on a small cast-iron plate in the same position. In addition to this, similar information is given in black figures on small enamelled white tablets which are affixed at one end of each coach of these three companies, on either side, just under the roof. This is by far the easiest position in which to read the weights from the platform, and is also adopted by the Midland, London and North Western, and Highland Railways, the first-mentioned company employing the enamelled plates, whereas the other two paint the weights on in large white figures. Several other companies mark the tare of each coach in small figures, usually on the frame just above the footboard, but, not employing the weight method in reckoning passenger train loads, the figures are not kept clean, and frequently become almost illegible after the vehicles have been running for a short time.

A reader may here remark that the addition of the empty weights of each coach does not furnish the actual weight of the train, as the weight of passengers and luggage must be considered. That is so, and in the matter of suburban trains, where maximum seating accommodation is provided and filled, the weight of the passengers forms a very considerable proportion of the total. For instance, one of the suburban workmen's trains of the Great Eastern Railway, conveying third-class passengers only, and consisting of 17 four-wheeled coaches, has seating accommodation for 972 persons. Assuming the train to be filled, the weight of the passengers, averaged at 1¼ cwt., or 10 st. 9 lbs. apiece—not an extravagant figure—would work out at no less than 65 tons. As the total weight of the empty train is only about 205 tons, the human freight adds an important 32 per cent. in this instance. Similarly in all cases where non-corridor compartment coaches without lavatories are used, the weight of the passengers is of considerable moment as regards the total load, particularly if the train be well filled.

In the total weight of modern express trains, however, with which we are principally concerned in these columns, the weight of the passengers is of minor, although even then not of negligible, importance. The provision of corridors, lavatories, restaurant and sleeping cars on the present-day express makes the weight hauled per passenger conveyed very much greater. For instance, the four-wheeled third-class coaches of the Great Eastern suburban stock, previously mentioned, weighing each about 12 tons, seat 60 passengers—an average of ·20 ton per passenger conveyed. A modern third-class corridor coach of the same company seats only 56 passengers, and weighs 26¾ tons—an average of ·48 ton per passenger, or more than double. Moreover, although the suburban coach generally conveys a full

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complement of passengers, the corridor coach is usually considered full with three passengers a-side, the four seats being only occupied at the very busiest times, which reduces the passenger load in the latter case to 49, representing ·55 ton coach-weight per passenger. Taking, then, the general average loading of modern corridor express trains in this country, where in most cases the seating accommodation errs on the side of liberality, the proportionate weight of passengers to train but rarely, if ever, exceeds 10 per cent., as, beyond the figures already given, there have in most cases to be reckoned in the weight of restaurant cars also. The proportionate weight of luggage to that of the brake-van in which it is conveyed may, on the average, be taken to correspond very closely to that of passengers to train.

It might be of interest to those who read these articles to know on what basis I usually reckon the increment due to the weight of passengers and luggage. It is, of course, almost impossible to count every passenger and still more to estimate the weight of every article of luggage, but, generally speaking, I have deduced several percentages which I think will be found to work out with a fair measure of accuracy. With a very light load of passengers, such, for instance, as is found on the special up coast expresses early in July, or the corresponding down trains early in September, I add 2½ per cent. to the total coach load. With a moderate complement of, say, three or four passengers in each third class compartment, I should allow 5 per cent., while with a well-filled train, up to six passengers per compartment, the figure would be 7½ per cent. On *exceptional* occasions, when every seat in the train is occupied and all the space available for luggage is filled, it becomes necessary to allow up to 10 per cent. extra for passengers and luggage. These figures refer principally to non-corridor trains, such as those on the South Eastern and Chatham Railway, or the London and South Western Bournemouth services, on which there is provided a large amount of lavatory accommodation. The last-named percentage would require, of course, to be increased in the case of a crowded express in the make-up of which a number of non-lavatory coaches were included. These figures, it may be added, are purely personal, but I give them in the hope that they may prove of interest, and perhaps of use, to readers. I may also repeat here that all the loads given in these articles, except where otherwise stated, include an approximate weight for passengers and luggage, but not that of the engines or tenders.

Photo] [*F. E. Mackay.*

LONDON AND SOUTH WESTERN RAILWAY.
West of England Express. Four-cylinder simple locomotive No. 371.

Performance now claims our attention, and, by the kindness of Mr. R. W. Urie, the Locomotive Superintendent of the London and South Western Railway, I am enabled

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to give details of some runs on that line. Unhappily, the misfortunes which seemed to dog all my journeys—from the running standpoint—in the South during the present summer were not absent on the London and South Western Railway, and most of the runs did not nearly attain to the standard of the series which I described in the September, 1912, issue of the RAILWAY MAGAZINE. For instance, on arriving one Saturday morning to travel by the 10.50 a.m. Plymouth express from Waterloo to Exeter, I found one of the early 4-cylinder 4–2–2–0 engines on this train, one of the very latest 4–4–0 engines on the 11 a.m. to Padstow, and a large 6 ft. 7 in. 4-cylinder 4–6–0 on the 11.10 a.m. to Ilfracombe—exactly the inverse order for time-keeping, as later proved to be the case. Not being particularly anxious to try the first of the three engines, I selected the middle train of the three, as the locomotives comprised in the last design of the late Mr. Drummond, prior to his untimely death, have the reputation of being very speedy machines. The engine was No. 472, and the load 10 corridor eight-wheelers (including a restaurant car) and a six-wheeler, totalling 320 tons behind the tender.

On the early stages of the run good work was done. Clapham Junction, 4 miles out, was passed in 7¼ min., at a fraction under 50 miles per hour, and the ensuing gentle ascent of 3⅜ miles to Wimbledon occupied 4 min. 10 sec. Accelerating rapidly along the level stretch beyond, the mile-a-minute rate was reached at Surbiton, and a further increase to 64·3 was recorded on the faint descent to Esher. The 4⅝ miles from Wimbledon to Surbiton took 5 min. 10 sec., and the 7⅛ miles thence to Weybridge 7 min. 20 sec., giving a total of 23 min. 55 sec. for the 19⅛ miles from Waterloo. Just beyond Weybridge there commences a 10½-mile rise (from 1 in 298 to 1 in 388); on this the 5¼ miles from Weybridge to Woking took 5 min. 35 sec., and the 3⅝ miles thence to Brookwood 4 min. 25 sec., speed falling near the summit to a sustained 46·9 miles per hour. A further momentary fall to 45·9 was recorded just at the top, probably due to premature notching up. On the level stretch past Farnborough a maximum of 56·3 miles per hour was touched, and speed kept much about this figure to Hook, rising, however, to 60 miles per hour on the short descent beyond that station. So the 5¼ miles from Brookwood to Farnborough took 6 min. 40 sec.; the 6¾ miles thence to Winchfield 7 min. 10 sec.; and the 7⅞ miles from Winchfield to Basingstoke 8½ min. Thus the 47⅞ miles from Waterloo to Basingstoke had taken in all 56¼ min., which was quite good with this comparatively heavy load.

From this point forward the work fell off somewhat, but evidently the driver was anticipating delay from the train ahead, and, as events turned out, he was justified in "easing up." On the ascent at 1 in 249 to Worting speed fell to 45 miles per hour, but improved on the favourable grades beyond to 60 at Overton, 64·3 at Whitchurch, and 68·1 at Hurstbourne. The 7¾ miles from Basingstoke to Overton took 9 min. 25 sec., and the 5⅝ miles thence to Hurstbourne 5 min. 20 sec. On the slight rise beyond Hurstbourne a minimum speed of 61·6 miles per hour was recorded, and the sharp descent to Andover did not tempt the driver above a top speed of 72·5 miles per hour. From Hurstbourne to Andover the 5¼ miles took 4¾ min., giving a total of 75¾ min. for the 66½ miles from London. There was now a still more pronounced falling off: on the ascent to Grateley, finishing with 2¾ miles at 1 in 165, the minimum speed was actually 33·8 miles per hour, and the 6⅜ miles from Andover to Grateley took as much as 9 min. 20 sec., while the ensuing 5½ miles to Porton also occupied 7 min. 5 sec., so that time-keeping was now out of the question. Down the long descent to Salisbury we ran freely at 75 miles per hour, but, as I expected, were brought to a dead stand outside the station, at the 83½ mile-post, waiting for the 10.50 a.m. express to start. Our time to this point was 95 min. 20 sec., although we could have maintained the 94-min. schedule to Salisbury (83¾ miles) with ease, had there been any expectation of a clear road throughout.

At Salisbury I was placed in a similar dilemma to that at Waterloo. Of the engine that had taken the 10.50 a.m. *ex*-Waterloo on to Exeter I was unaware, but a large 4–4–0 of the earlier type backed on to my train, while I could see a 4-cylinder 4–6–0, again of the 6 ft. 7 in. type, waiting for the Ilfracombe express. As is well known, the first of the three trains calls at Sidmouth Junction, the second has a 98 min. non-stop booking to Exeter, while the third is the only train left with the original 96 min. booking for this 88 miles—an unusual inversion of times which is very difficult to adhere to in practice without delays. On this occasion I alighted from the Padstow train,

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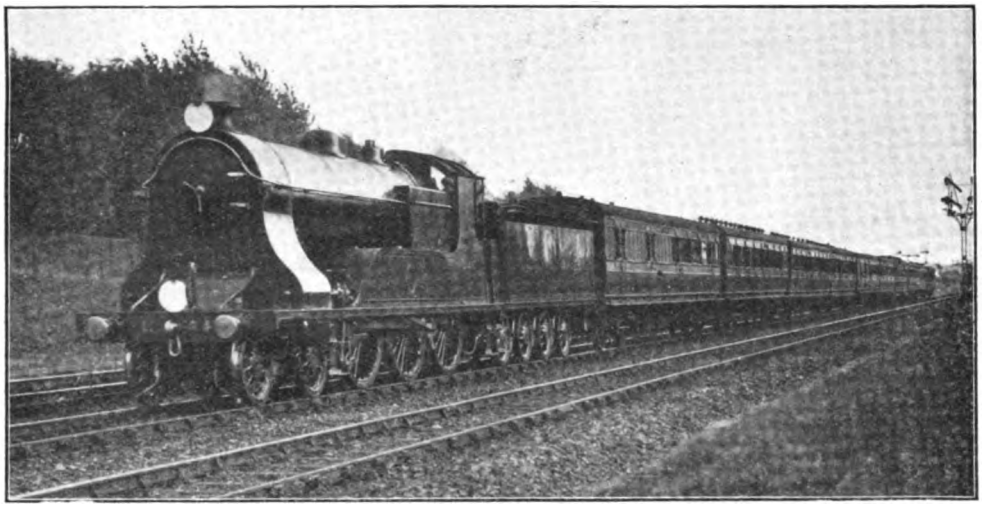
and waited for that to Ilfracombe, which was similarly made up, save that two four-wheeled vans replaced the one six-wheeled van, bringing the load to 325 tons. The engine was No. 445, but here the fears of subsequent delays—unfortunately well founded—interfered with and spoiled the running throughout. Even on starting we had to whistle for signals and were checked momentarily before passing Wilton, so that the first $8\frac{3}{8}$ miles to Dinton took 12 min. 55 sec., while the ensuing $9\frac{1}{4}$ miles to Semley occupied 11 min. 20 sec. The major part of this distance is uphill, and at the top of the final 1 in 145 our lowest speed was 42·9 miles per hour. Steam was shut off for part of the following descent, but a maximum of 75 miles per hour was touched at Gillingham, brought us down as low as 30·8 miles per hour at Hewish box. The $11\frac{5}{8}$ miles from Yeovil to Hewish took $13\frac{1}{2}$ min. No great speed was attained on the tempting down-grade to Axminster; for the major part of the distance we were running at 73·8 miles per hour, and only briefly touched 75. So this $10\frac{1}{4}$ miles of real "racing-ground" from Hewish to Axminster took as much as $9\frac{1}{2}$ min., and the $3\frac{1}{4}$ miles on to Seaton 2 min. 55 sec. On the last—and worst—ascent of the journey, the $4\frac{1}{2}$ miles at 1 in 70–80 culminating at Honiton Tunnel, our speed fell to 22·2 miles per hour, the $4\frac{3}{4}$ miles from Seaton to mile-post $152\frac{1}{2}$ taking 9 min. 20 sec., and the $2\frac{1}{4}$ miles thence to Honiton 3 min. 55 sec. Down to Exeter we ran at a fair speed, touching 77·5 miles per hour at Sidmouth



Photo] [*F. E. Mackay.*

LONDON AND SOUTH WESTERN RAILWAY.

Up Torrington Luncheon Car Express. Four-cylinder simple 4–6–0 locomotive No. 447.

and again at Templecombe, after a minimum of 56·3 on the short intervening rise. The $10\frac{7}{8}$ miles from Semley to Templecombe took 10 min. 20 sec., giving a total time of 34 min. 35 sec. from Salisbury, $28\frac{1}{2}$ miles.

On the 1 in 100 past Templecombe speed fell to 42·5 miles per hour, but rose to 78·9 on the 1 in 80 approaching Sherbourne, the 6 miles between these two stations taking 6 min. 55 sec., and the $4\frac{5}{8}$ miles on to Yeovil 3 min. 50 sec. This gave a total of 45 min. 20 sec. for the $39\frac{1}{8}$ miles from Salisbury, or over 2 min. loss on schedule. Past Sutton Bingham the rising grades culminating at 1 in 140 reduced our speed to 46·9 miles per hour, and, with a brief acceleration to 66·2 beyond, the 1 in 80 ascent past Crewkerne Junction and 81·8 at Broad Clyst; the 4 miles from Honiton to Sidmouth took 4 min. 5 sec., and the 11 miles thence to Exmouth Junction 9 min. 20 sec. Finally, as I expected, we were stopped dead in the yard at Exeter, opposite the $171\frac{1}{2}$ mile-post, having taken altogether 99 min. 35 sec. for this $87\frac{3}{4}$-miles' run, equivalent to 100 min. to the station itself. On many British lines this would be considered a fine run with a 325-ton train load and a ruling grade of 1 in 80, but I do not doubt that, under better circumstances, a far finer effort would have been made.

A down journey to Bournemouth gave much more favourable results. On this occasion the 10.15 a.m. down express loaded

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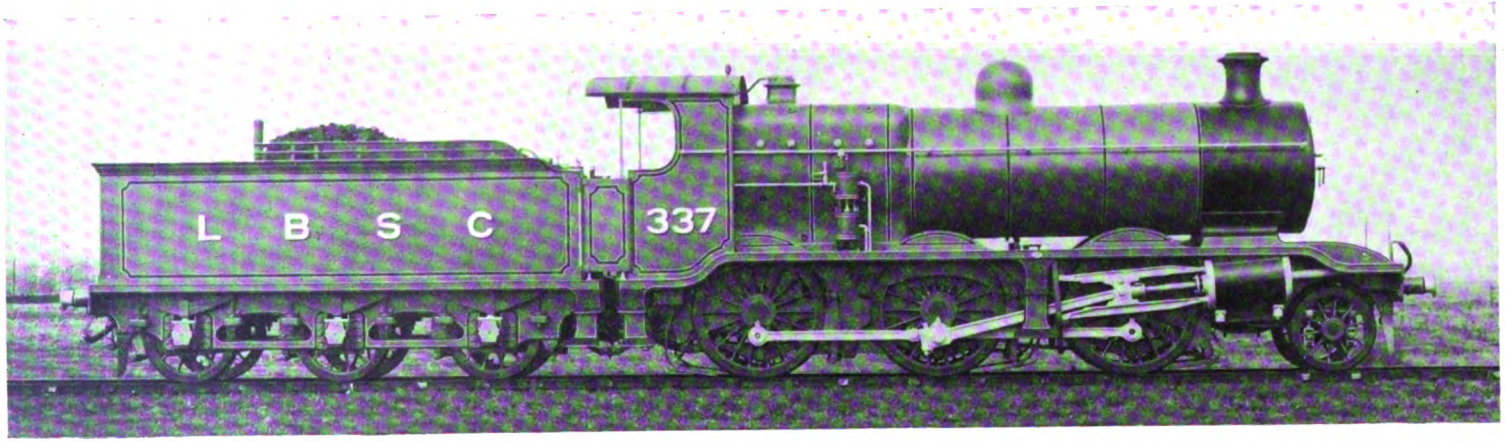
Superheater Express Goods Engine: London, Brighton and South Coast Railway.

Designed by Mr. L. Billinton, Locomotive Engineer.



The first of five new 2–6–0 express goods engines designed by Mr. L. Billinton has now been completed at Brighton Works and is illustrated above. These are the first locomotives of the "Mogul" type on the Brighton line, and are interesting in that a Belpaire firebox is employed, a superheater is included, the feed water is heated in the tender tanks by exhaust steam, and a Weir feed pump is placed on the left hand side of the firebox. A steam cock and ejector are provided to conserve heat usually wasted by blowing off at the safety valves, the excess steam being blown into the feed water in the tender tank. The reversing shaft is fitted with a clutch operated by compressed air, which steadies the motion and relieves the thrust on the reversing rod and screw when the engine is working. The cylinders are fitted with a new type of combined vacuum and water relief valve, placed on the bottom at each end of the cylinder barrel.

Leading dimensions are as follows:

Cylinders	21 in. dia. by 26 in. stroke.
Piston valves	10 in. dia.
Coupled wheels	5 ft. 6 in. dia.
Pony	3 ft. 6 in. dia.
Working pressure	170 lb. per sq. in.

Heating surface—	
110 tubes, 2¼ in. dia.	790 sq. ft.
21 tubes, 5⅛ in. dia.	366 sq. ft.
Firebox	139 sq. ft.
Total	1,295 sq. ft.
Superheater tubes	279 sq. ft.
Total	1,574 sq. ft.
Grate area	24·8 sq. ft.
Maximum weight of engine in working order	63½ tons.
Maximum weight of tender in working order	41½ tons.

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to 11 eight-wheelers and a six-wheeler, but, this being non-corridor stock, the total weight behind the tender did not exceed 315 tons. This is an easily booked train, and time was gained steadily. Clapham Junction, 4 miles, was passed in 7 min. 55 sec. (booked 9); Surbiton, 12 miles, in 17 min. 35 sec.; Weybridge, 19⅛ miles, in 25 min.; Woking, 24⅜ miles, in 30 min. 40 sec. (scheduled 33); Farnborough, 33¼ miles, in 42 min. 5 sec.; Winchfield, 40 miles, in 49 min. 10 sec.; and Basingstoke, 47⅞ miles, in 57 min. 50 sec., although booked exactly one hour. Beyond Worting Junction we ran under very easy steam, speed falling to 36 miles per hour at this point, and not exceeding 66·2 on all the long descent past Winchester. The 10¼ miles from Basingstoke to Micheldever took 13 min. 25 sec.; the 8½ miles thence to Winchester 8 min., and the 7 miles thence to Eastleigh 9 min., with a very severe slack by signal at Allbrook Junction before taking the loop platform road. However, we stopped at Eastleigh, 73⅝ miles from Waterloo, in 88¼ min.—87 min. net—against a schedule time of 90 min. Onwards to Southampton West the 5⅝ miles took 10¼ min., ¼ min. being lost on the booking in drawing slowly up to the water column at the latter station. Here we dropped a coach, reducing the load to 290 tons, and, thus lightened, ran to Brockenhurst, 13⅝ miles, in 19 min. 35 sec., although booked to take 20. Detaching here two further vehicles for Lymington, in spite of a slow start we covered the 6 rising miles to New Milton in 10 min. 35 sec.; ran rapidly over the falling grades to Christchurch, covering the 5½ miles in 5 min. 20 sec., and touching a maximum of 72·5 miles per hour, and then negotiated the remaining 3⅝ miles into Bournemouth Central in 4¾ min. Thus this last 15⅛ miles' stretch had been covered in 20 min. 40 sec. instead of 21 min., so that some time had been gained on every section from Waterloo, which was very creditable.

No such good fortune attended my return by the 2 p.m. two-hour express from Bournemouth to London. In this instance the load was only 10 eight-wheelers, or 270 tons, and the engine a four-cylinder 4–6–0, No. 446, but the work was rather disappointing throughout. Christchurch, 3⅝ miles, was passed in 6¼ min., but on the ascent to Hinton Admiral, culminating at 1 in 103, speed fell to 36·6 miles per hour; also we slackened severely through Brockenhurst, making the time from Bournemouth to that point—15⅛ miles—20 min. 20 sec. On to Totton the 10¼ miles took 10 min. 20 sec., but the usual service slack here was succeeded by signal checks beyond to Northam Junction, which caused loss of time. In fact, the 4⅜ miles from Totton to Northam Junction took us in all 7 min., so that we had lost over a minute on schedule at this point, which is generally passed well before time. The

Photo] [*F. E. Mackay.*

LONDON AND SOUTH WESTERN RAILWAY.

Bournemouth and Weymouth Express. Four-cylinder 4–6–0 locomotive No. 443.

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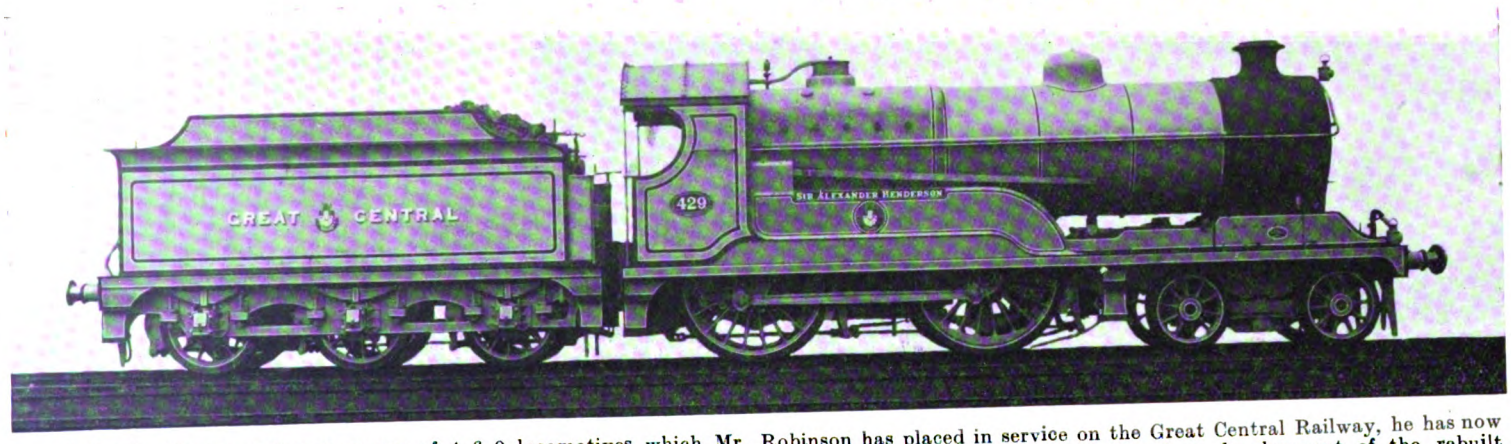
NEW 4-4-0 SUPERHEATER LOCOMOTIVE: GREAT CENTRAL RAILWAY.

Designed by Mr. J. G. Robinson, Chief Mechanical Engineer.



Following the interesting sequence of 4–6–0 locomotives which Mr. Robinson has placed in service on the Great Central Railway, he has now turned his attention to the 4–4–0 express, for which there is still abundant scope on this line. The design is a development of the rebuilt superheater 4–4–0 engines. The first engine of the new class, No. 429, bears the name of the Chairman of the Company. Leading dimensions are as follows:—

Cylinders	20 in. by 26 in.
Piston valves	10 in. dia.
Connecting rods	7 ft. 11¼ in. long.
Wheels— Bogie	3 ft. 6 in. dia.
Coupled	6 ft. 9 in. dia.
Tender	4 ft. 4 in. dia.
Boiler— Length of barrel	12 ft. 3 in.
Diameter of barrel	5 ft. 3 in.
Firebox—Length (outside)	8 ft. 6 in.
Tubes, steel (outside)	175-1⅞ in. dia.
„ „ „	24-5¼ in. dia.
Superheater—"Robinson" type.	

Heating surface—		
Firebox	157 sq. ft.	
Tubes	1,502 sq. ft.	
Superheater	304 sq. ft.	
Total	1,963 sq. ft.	
Grate area	26 sq. ft.	
Weight in working order—		
On bogie wheels		21 tons 8 cwt.
On coupled wheels		39 „ 12 „
Total of engine		61 „
Tender		48 „ 6 „
Total of engine and tender		109 „ 6 „
Tank capacity		4,000 gallons.
Coal capacity		6 tons

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recovery from the slack was not brilliant, but on the easy grades to beyond Eastleigh we attained a speed of all but 50 miles per hour, covering the 5⅝ miles from Northam Junction to Eastleigh in 6¾ min., and the 7 miles thence to Winchester in 9 min. 5 sec. Hard collar-work is involved in the 16¼ miles of up-grade, varying from 1 in 245 to 1 in 260, which extend from a point 1½ miles north of Eastleigh to one 2½ miles beyond Micheldever, and on this incline the speed settled down to a steady 45·9 miles per hour. For a brief space this fell to 45, but improved again to 45·9 near the summit. Thus the 8½ miles from Winchester to Micheldever took 10 min. 55 sec., and the 7⅞ miles thence to Worting 9 min. 5 sec.

Here a most unaccountable period of sluggishness set in: on the falling grade to Woking, despite a clear road, we appeared to run without steam, and had not even touched the mile-a-minute rate on passing the station —indeed, the 2⅜ miles from Worting took 2 min. 35 sec., and we were now no less than 5 min. 5 sec. behind time. After this, matters brightened a little. A top speed of 70·3 miles per hour was touched before Hook and again beyond Winchfield; the minimum after Farnborough was 63·8, and we then gradually accelerated on the falling grades until we had reached the very high speed of 77·5 miles per hour beyond Woking. The 23½ miles from Basingstoke to Woking took 21 min. 10 sec. (booked 22); the 12⅜ miles from Woking to Surbiton 11 min.; the 8 miles Surbiton to Clapham Junction 8¾ min.; and the last 4 miles into Waterloo 5 min. 50 sec. In this way we had gained 2¼ min. from Basingstoke, having covered the 47⅞ miles in 46¾ min., but were still 2 min. 50 sec. behind the scheduled time of arrival. Possibly without the checks outside Southampton and with normally fast running from Worting to Basingstoke we might have kept time, but it would have been a very close thing, and, in any case, the uphill work was not that to which we are accustomed with these 4–6–0 engines.

In the brief space remaining at my disposal, while the subject of seaside expresses with their congenial holiday associations is in our minds, I wish to refer to the seaside expresses of the North Eastern Railway. I do not suppose there is a single line in these islands to compare with the North Eastern Railway in the matter of really fast cross-country running in every direction, and the seaside business expresses provide the most brilliant feature. The principal of these are three in number, *i.e.*, Leeds-Scarborough, Leeds-Bridlington, and Sheffield-Bridlington. The best known, and the most remarkable, is the 75-min. booking of the first-mentioned over a 68¾ miles' route, averaging 55 miles per hour despite a dead slack through York, and 5 miles of winding line along the banks of the River Derwent, on which speed must not exceed 45 miles per hour. Closely approaching this is the Leeds-Bridlington express, 73 min. being allowed in this case for a 63¼ miles' run, averaging all but 52 miles per hour with very severe slacks at Selby, Market Weighton and Driffield, and a steep pull over the Wolds between the two last-mentioned points. The Sheffield-Bridlington express, which during last summer was dignified by the addition of a restaurant car, covers the 76 miles from Rotherham to Bridlington in 94 min., with all the slacks last-mentioned, and, in addition, those at Swinton and Milford Junction, together with slow running over the difficult Swinton and Knottingley Joint Line. Incidentally, these runs will bear out Mr. Maurice Sergeant's

Photo] [*R. J. Purves.*

NORTH EASTERN RAILWAY.

9 a.m. Leeds-Edinburgh Express passing Manors East.
4–4–2 locomotive No. 784, Class V.

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remarks in his able article on "British Single-Wheelers" which appeared in the last issue of the RAILWAY MAGAZINE, as these trains are invariably worked by the 7 ft. 7 in. 4–2–2 engines of Class J, and were so hauled on the occasions on which I timed them.

Reserving the best experiences for the last, I will commence with the Sheffield-Bridlington run, on which the load consisted of a twelve-wheeled restaurant car, an eight-wheeled corridor coach and an eight-wheeled third-class brake, weighing in all 105 tons. The engine was No. 1521, 4–2–2 type. Leaving Rotherham, the first 5 miles over the Midland main line to Swinton took 7¾ min., and here we slacked severely before complete the remaining 43¼ miles. Selby, ¾-mile away, was passed in 2 min. 40 sec. from the start, and on the level stretch beyond an even speed of 61·6 miles per hour was maintained, the 17½ miles from Selby to Market Weighton taking 19½ min. After Market Weighton slack the ascent of the Wolds was tackled in good style, speed not falling below 36·6 miles per hour on the 1 in 100, and rising to a maximum of 71·4 miles per hour on the steepest part of the descent beyond. The 3¾ miles from Market Weighton up to Enthorpe took 5¾ min., and the 10 undulating miles thence to Driffield 10 min. 20 sec., a further bad slack ensuing at this point. Beyond Driffield we once again on the

NORTH EASTERN RAILWAY—LEEDS AND SCARBOROUGH.

Distance (miles)	Engine / Class and Type / Driver / Load	1523 J 4–2–2 Goodwin 85 tons	Max. and min. speeds (m.p.h.)	1523 J 4–2–2 Goodwin 85 tons	Max. and min. speeds (m.p.h.)
—	Leeds (New Station) ..	0.00	—	0.00	—
4½	Cross Gates	7.30	51·1	6.50	52·9
9¼	Micklefield	12.55a	68·1	12.10a	73·8
14¾	Church Fenton	17.10	80·3	17.00d	84·9
18	Bolton Percy	20.00	66·1	20.30	63·8
23¾	Chaloner Whin Junction ..	25.25	60·0	25.25	73·8
25½	York (centre of Station) ..	28.15b	—	27.55b	—
29¾	Haxby	34.10	63·8	33.35	—
34¾	Flaxton	38.50	67·0	38.00	71·4
37	Barton Hill	41.00	61·6	40.00	68·1
41¼	Castle Howard	45.45c	—	44.40c	—
46½	Malton	52.20a	—	50.55a	—
51	Rillington	57.10	64·3	55.25	—
55	Heslerton	60.40	73·8	58.50	73·8
60	Ganton	64.50	75·0	63.05	76·3
64½	Seamer	69.00a	—	67.15a	—
67½	Scarborough	73.45	—	71.40e	—
67½	Net times (mins.)	73¾	—	69½	—

a Service slack (very slight). b Dead slow through York (the passage of the platforms took exactly 60 sec. on each run). c Derwent Valley curves (45 m.p.h. for 5 miles). d Signal check (severe). e Signal check, Washbeck (slight).

diverging to the left. Various fluctuations of speed between 45 and 62½ miles per hour were produced by the sharp changes of grade on the Swinton and Knottingley Joint Line, the 5½ miles from Swinton to Frickley taking 8 min. 20 sec., the 9¼ miles thence to Pontefract 10 min. 20 sec., and the 5¾ miles from Pontefract to Monk Fryston 7 min. 5 sec. At Milford Junction we reduced speed with great caution, but accelerated to 55·6 miles per hour at Hambleton; misfortune awaited us, however, in the shape of a dead stop—only momentary—at Wistow Junction, outside Selby. The 32¾ miles to this point had taken 43¼ min., and we had, therefore, only 50¾ min. left in which to level accelerated to 61·6 miles per hour, and completed the last 11½ miles from Driffield to Bridlington in 13½ min. The 42½ miles from Selby had been covered in 48 min. 40 sec., and the 76 miles from Rotherham in 94 min. 35 sec., the slight loss on schedule being more than accounted for by the momentary stop outside Selby.

Following this I made an excursion on the Leeds-Bridlington express, which leaves the former station at 4.47 p.m., and is due at Bridlington at 6 p.m.; on the occasion of travelling the usual load of four eight-wheelers was in evidence, totalling with passengers 105 tons, and hauled by the 4–2–2 engine No. 1524. The start was inauspicious,

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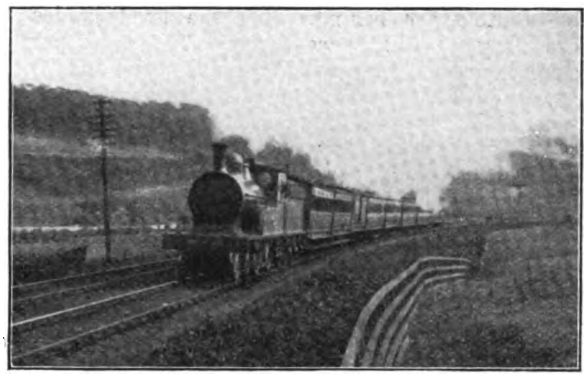

Photo] [*A. Brailsford.*

LONDON AND NORTH WESTERN TRAIN NEAR SCARBOROUGH.

North Eastern 4–4–0 locomotive No. 18.

as we were almost stopped by signal at Waterloo Junction, between Marsh Lane and Cross Gates, so that our ascent of the initial up grade was hampered. Cross Gates, 4¾ miles out, was passed in 8 min. 25 sec., and Micklefield, 9¾ miles, in 14 min. 15 sec., a speed of 67 miles per hour being attained at this point. The 6¾ miles from Micklefield to Hambleton, principally falling, were covered rather sluggishly in 6 min. 35 sec., and then came, once again, a dead stop outside Selby at Wistow Junction, the 20 miles to this point having taken 25 min. 10 sec. or about 23½ min. net. Starting again after a stop of 25 sec. duration, we had but 47 min. 25 sec. left on this occasion for the last 43¼ miles, and finer work than that of the last run was therefore imperative.

Passing Selby, ¾-mile from the stop, in 2¼ min., we attained the mile-a-minute rate in 3 miles, and accelerated further to a maximum of 64·3 miles per hour at Foggathorpe, so that the 17¼ miles from Selby to Market Weighton were covered in 18¼ min.—1¼ min. faster than previously. The ascent of the Wolds was much finer, Enthorpe, 3¾ miles from Market Weighton (passed slowly) being reached in 5¼ min., with a minimum speed as high as 41·3 miles per hour. The undulating grades beyond were traversed at speeds varying from 63·8 to 72·5 miles per hour, the 7¼ miles from Enthorpe to Southburn taking only 6 min. 35 sec., so that a further 1 min. 35 sec. had been gained on the times of the preceding run, and time-keeping was practically assured with a clear road. But this was not to be, as, after a cautious approach to Driffield, we were stopped dead just east of the station on account of a goods train shunting just ahead. The 2¾ miles from Southburn to Driffield had taken 3¼ min.; 35 sec. later we stopped—for a brief ¼-min.—and the engine then gave us the finest exhibition of the journey, passing Nafferton, 2 miles, in exactly 4 min. at 60 miles per hour, covering the 7¼ miles from Nafferton to Carnaby in 6 min. 40 sec., and the distance of almost 11¼ miles from outside Driffield to Bridlington start-to-stop in 13¾ min. Needless to say, with two dead stops, time had been lost—to the extent of 2¾ min.; the actual running time was 75 min. 10 sec., and the net time not more than 70½ min. for the 63¼ miles.

These runs, however, are altogether overshadowed by two that I enjoyed on the Leeds-Scarborough "Limited" during the past summer. In both cases the load was only trifling, consisting of three eight-wheelers and totalling 85 tons, but the work of the 4–2–2 engine No. 1523, ably handled by Driver Goodwin, of Leeds, is of such superlative merit as to call for tabulation. The first run, though fine, was not exceptional. A speed of 51·1 miles per hour was maintained up the 1 in 160 and 168 past Cross Gates, and then rose, after a faint check at Micklefield, to the very high figure of 80·3 miles per hour on the 1 in 132 descending to Church Fenton, where we "eased" considerably. A good speed was also maintained along the level stretch to York, the centre of which station was passed dead slow, ¾ min. ahead of time. Very fine work followed on the level stretch beyond, the engine accelerating rapidly to 67 miles per hour, which speed fell to 61·6 on the faint rise to Barton Hill. After the usual moderate rate on the curved 5-mile section, and a faint slack at Malton, brilliant running was made on the level stretch beyond Rillington, a speed of 73·8 miles per hour being maintained for miles, with a momentary maximum of 75 near Ganton. On this excellent run, therefore, 1¼ min. were economised on schedule time.

These times, however, are completely eclipsed by those of the second run, which is one of the finest trips I have ever made behind a single-wheeler, and demonstrated the speed capabilities of these remarkable engines to the very utmost. At the start the work was excellent, a speed of 52·9 miles per hour being attained on Cross Gates bank, while beyond Micklefield the terrific maximum of all but 85 miles per hour was sustained for an appreciable distance. I may say that this figure, and, indeed, all other figures of this journey, were checked by the

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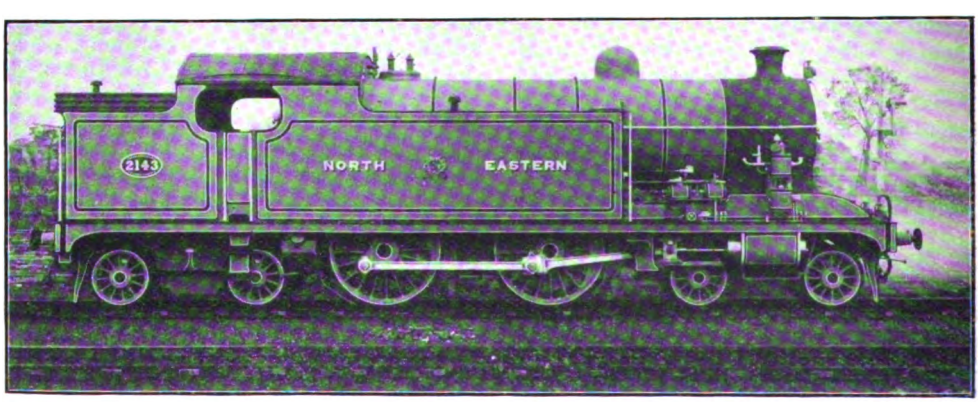
stop watch of a Scarborough friend and co-enthusiast travelling with me, all of whose records on this train, as well as my own, went " by the board " on this memorable journey. At this tremendous speed the running was remarkably smooth, despite the very light load. Unfortunately we were checked severely by signal outside Church Fenton, but, accelerating with lightning rapidity, we were going at 73·8 miles per hour by the time we passed Copmanthorpe, despite the very faintly rising grade. A Midland express which had cheerfully steamed past us on the adjacent line at Church Fenton suffered the indignity of being overhauled and passed within the next 2 miles. By Chaloner Whin we had tied with the times of the first run, despite our check, and running faster on to York, were 20 sec. ahead at that point.

Gaining speed more rapidly, this had become 35 sec. ahead at Haxby, and thereafter the times of the first run were left altogether behind. On the level grades beyond Haxby we touched 71·4 miles per hour, and breasted the 2 miles of 1 in 295 and 309 past Flaxton at 68·1. From York to Malton in 23 min. was a remarkably fine time, with so slow a start and the 5 miles of curves, but finer was to follow, as on the faintly undulating stretch to Ganton we actually touched 76·3 miles per hour, and so completed the 21 miles from Malton to Scarborough, despite a signal check at Washbeck, in 20¾ min. With all checks we had gained 3 min. 20 sec. on schedule, but the net time could not have exceeded 69½ min. at the very most, and possibly 69 min., which means a gain of 6 min. on this difficult booking. Driver Goodwin deserves the heartiest congratulations for this wonderful effort, which certainly constitutes one of my very finest runs of the year, and is entitled to take a front place in the ranks of even modern locomotive achievements.

4-4-4 Passenger Tank Engine: North Eastern Railway.

Designed by Mr. Vincent L. Raven, Chief Mechanical Engineer.



Twenty three-cylinder 4–4–4 superheater tank engines of the class illustrated above are being constructed at the Darlington Works of the North Eastern Railway. They are intended to replace the lighter four-coupled engines in heavy local passenger traffic. The three cylinders are in one casting and are fitted with piston valves. Leading dimensions are as follows: Cylinders (3), 16½ in. by 26 in.; coupled wheels, 5 ft. 6 in.; steam pressure, 160 lbs.; heating surface—tubes, 934·84 sq. ft.; Schmidt superheater, 273 sq. ft.; firebox, 124 sq. ft.; total 1331·84 sq. ft.; grate area, 23 sq. ft.; coal capacity, 4 tons; water capacity, 2,000 galls.; total weight in working order, 84 tons 15 cwt.

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Photo] *[Photochrom Co., Ltd.*

ADVANCE LUGGAGE AT TALBOT ROAD STATION, BLACKPOOL.

The Biggest Holiday Traffic in the World.

By W. T. PERKINS.

BLACKPOOL stands pre-eminent in respect of the volume of its annual holiday traffic by rail. Public road coaches first began to run to this popular Lancashire coast resort in 1816, and 14 years later a crude attempt was started to form a promenade, by fixing wooden railings above high-water mark along a portion of the foreshore. But it was not until 1840 that the locomotive made its appearance in the neighbourhood. In that year lines were opened from Preston to Lancaster and from Preston to Fleetwood and in February, 1845, Lytham was reached by rail. The next year witnessed the completion of a connection between Poulton and Blackpool, and the eager patronage which the earliest excursion train received foretold the great success since recorded. In 1863, simultaneously with the inauguration of the North Pier, a coast railway was completed from Blackpool to Lytham, and seven years later the permanent promenade was opened amid great public rejoicing.

From that period onwards the progress of the town has been literally phenomenal, and now it annually caters for a far larger number of holiday-makers than any marine resort in the world. The industrial holidays or "wakes" of the north, begin early in June, and continue without interruption till the middle of September. But even this period does not represent the whole of Blackpool's festive season, which in reality extends throughout the year, as the resort is largely patronised both at Christmas and at Easter. In fact, during the former period the hotels and principal boarding houses are occupied by house parties, and special trains are run to meet the requirements. The prolongation so much desired in other British health and holiday resorts was long since anticipated by the active men who control the destinies of this busy Lancashire "lung." An aspect which at

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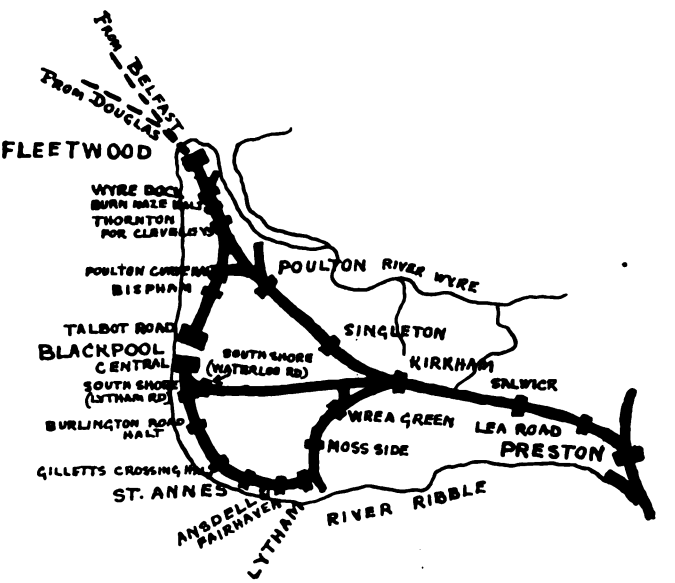
times faces keen winds and tempestuous seas did not deter these people from investing Blackpool with irresistible indoor attractions on a scale nowhere else attempted, and the result is that in fair weather or in foul, visitors always find plenty to interest and amuse them.

"Municipal expenditure running into three parts of a million sterling," as the official guide of the Corporation states, "has given Blackpool a promenade three miles long, and as broad as an arrow's flight, which is unequalled in Europe." But further extentions of this grand marine boulevard are now proposed, and before long the promenade will be carried a mile further in the direction of St. Annes. At the other end of the foreshore, an electric tramway—supplying a service all the year round, and maintaining 40 cars or more during the summer months—is rapidly developing a group of attractive places that will eventually, I doubt not, form units in a seaside chain stretching in almost unbroken line from Fleetwood to the southern boundary of Blackpool, and excelling in every respect the extensive promenades of the Belgian coast. The municipal tramways link up with the systems that skirt the sea as far as Fleetwood to the North, and as far South as Lytham, giving a coast journey of twenty miles within sight of the sea. Growing suburbs may be explored from the breezy comfort of an open "toast-rack" car, which traverses a circular tour of five miles, including two miles of promenade in the interesting and varied itinerary, for a modest fare of fourpence.



THE RAILWAYS SERVING BLACKPOOL.

For autumn and winter Blackpool caters just as thoroughly as it does for spring and summer. More than half-a-dozen golf courses are within easy access, and their clubs extend to visitors a welcome which is characteristic of northern hospitality. In addition to the outdoor sports associated with the seasons, horse-racing is a prominent feature of the yearly programme, and the steeplechase meetings at Clifton Park attract large numbers of people, not merely from Lancashire, Yorkshire, and the Midlands, but from more distant parts of the country, the through rail services always available being especially appreciated at such times.

"During September and early October," the Corporation book states, "one thousand of the finest professional bowlers do

THE CENTRAL STATION, BLACKPOOL.

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battle on the Talbot Hotel green in the most famous of all bowling tournaments. On the Waterloo Hotel green, South Shore, a smaller but growing tournament brings together about 400 bowlers, including many of the most famous trundlers of the biased ball. A well-kept municipal green in Central Drive is a popular resort of the amateur. Good Second League football is played on the Blackpool club's ground at South Shore."

Indoor places of entertainment include the Winter Gardens (where Mr. Sims Reeves was so fond of singing); the Tower, with its zoological collection, aquarium, Eastern city, roof garden, aquatic and variety circus, the biggest restaurant in England, and the largest ballroom in the world. Then there are theatres and music halls handsomely providing for thousands at every performance, and at least a dozen cinema houses of the most approved design. The Pleasure Beach, South Shore, has quite recently created another vast and varied centre of amusement upon what were sand dunes only a few years ago; and there, as everywhere else, the daily holiday scene is one of ceaseless activity.

Strangers to Blackpool can form no conception of the amount of its railway traffic. In 1881 the total number of excursion trains which entered the two stations named did not exceed 300. But during the season recently ended more than that number were twice received in a single week—at Whitsuntide and again at the August Bank Holiday. In 1885, *thirty thousand* visitors in a day was a "record" number; but now on several days each year the total reaches the astounding figure of *one hundred and twenty thousand!* This year the busiest season opened earlier than on any previous occasion, and a stupendous traffic was maintained uninterruptedly till beyond the middle of September. Indeed, during the week ended the 26th of that month (when the majority of pleasure seekers had disappeared from many much less exposed watering-places), 54 well-filled special trains entered Blackpool.

Photo] [*Photochrom Co., Ltd.*

ARRIVAL OF EXCURSIONISTS: CENTRAL STATION, BLACKPOOL.

The Central station is devoted exclusively to passenger traffic, and there are throughout the summer months 14 different platforms in daily use, each accommodating from 15 to 21 carriages. Up to the end of September this year, the traffic at the station far exceeded that of any twelve months during the last 17 years. In the four preceding years the largest number of special trains in and out was as follows:—

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MR. HENRY SCHOFIELD.
Stationmaster, Talbot Road Station, Blackpool.

1909 ..	..	1,784 specials inward.
1910 ..	..	1,699 ,,
1911 ..	..	1,576 ,,
1912 ..	..	1,753 ,,

The number in 1909 showed an abnormal increase as the result of the first aviation meeting arranged by the town, while the serious diminution in 1911 was due solely to the railway strike. Outward the corresponding figures were :—

1909 ..	..	1,751 specials.
1910 ..	..	1,582 ,,
1911 ..	..	1,585 ,,
1912 ..	..	1,813 ,,

It will be seen, therefore, that the traffic of 1912 required 62 more special trains than did that of 1909, when the unusual attraction of airship contests was provided. The heaviest day's traffic experienced this year was on August 16, when the numerous special events led to an unequalled demand upon the excursion accommodation.

On the day mentioned (August 16th), 51 special trains ran into the Central station, the first arriving at 6.22 a.m. and the last at 4.15 p.m. Not one of these trains brought less than 500 passengers, and it would, perhaps be no exaggeration to say that the majority contained a larger complement. All travelled over Lancashire and Yorkshire and London and North Western metals, and remarkable punctuality was, as a rule, observed. But while 51 special trains came in, 70 were scheduled to leave, and as a matter of fact the actual number despatched from the station was 74, four extra having to be run to carry the crowds who began to await departure soon after 9 a.m. Holiday makers in Blackpool are not permitted to remain in their lodgings until noon, as is the practice in many resorts. They have to make room for new comers as soon as breakfast is over. Consequently the morning exodus begins early, and on the day mentioned 11 long special trains left the Central station between 9.30 a.m. and 11 a.m. Trains were starting at comparatively short intervals thenceforward until 10 p.m., and the last day excursion did not leave until 12.30 midnight. Much of this pressure might be avoided if fewer industrial holidays were fixed for the month of August, which is, moreover, rarely, if ever, the pleasantest month of the season.

Talbot Road station, the other terminus, in some respects presented at times a still more astonishing picture than did the Central, by reason of the fact that, in addition to an enormous passenger traffic, it has to deal with all the luggage in advance and the horse-box traffic. The following figures show the extent of the luggage in advance consignments in four months of the present year :—

MR. F. GOUGH.
Stationmaster, Central Station, Blackpool.

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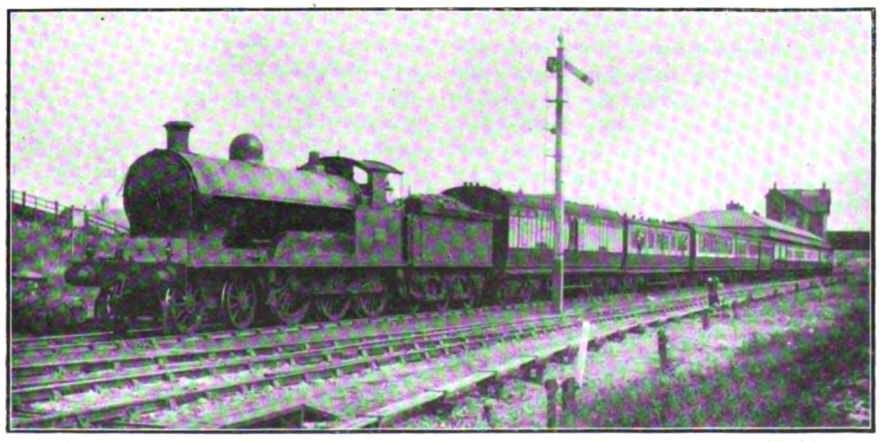
	Separate consignments.
May	4,520
June	3,936
July	16,767
August	31,694
Total	56,917

During August it was necessary to run in a day as many as four trains carrying nothing but luggage in advance, and 60 lurries were engaged in the subsequent town deliveries. The largest number of consignments received and delivered in one day was 3,000, and the whole of the work was performed so expeditiously that complaints of delay were rarely heard.

At present Talbot Road station contains 15 platforms. This year there has been a great increase in the number of passengers arriving at Talbot Road, the proportion coming from Scotland, the Midlands and South Wales being larger than ever. The good conduct of the visitors was particularly noticeable, and policemen were rarely, if ever, needed, unruly behaviour being conspicious by its absence, even when the station remained open night and day from the Friday before the August Bank Holiday. On that occasion 54 special trains arrived, each bringing a minimum of 500 passengers, and 50 were despatched, taking away an equal number. The first train came in at 3.11 a.m. on Monday, having started from Birmingham about 11 p.m. on Sunday, and the last of the Bank Holiday specials left Talbot Road at 12.30 a.m. on Tuesday. On August 16 (Saturday) 59 special trains entered the same station, and 53 were despatched therefrom, each carrying at least 500 passengers. Every week end during the period covered by the various "wakes" there were not fewer than 40 special trains in and out, while the ordinary trains numbered 61 in and 65 out. That this enormous traffic should have been conducted without accident or hitch of any sort is in the highest degree creditable to the officials of the two companies concerned.

In addition to the foregoing there is a very large traffic between Blackpool (Talbot Road) and Fleetwood in connection with the sailings of the steamers twice daily from the latter port to the Isle of Man and Barrow (for the Lake district) as also to Morecambe and Heysham. In fact it has on many occasions been necessary to run special trains conveying upwards of 700 people for the various steamer excursions from Fleetwood, which have become exceedingly popular. In the opposite direction there is also a big traffic of day excursionists to Blackpool from Douglas, Barrow, Morecambe and other places.



Photo] [*E. Mason.*

LONDON AND NORTH WESTERN RAILWAY: LEEDS-BLACKPOOL EXPRESS AT ANSDELL.
4–6–0 Locomotive No. 1988, *Hurricane.*

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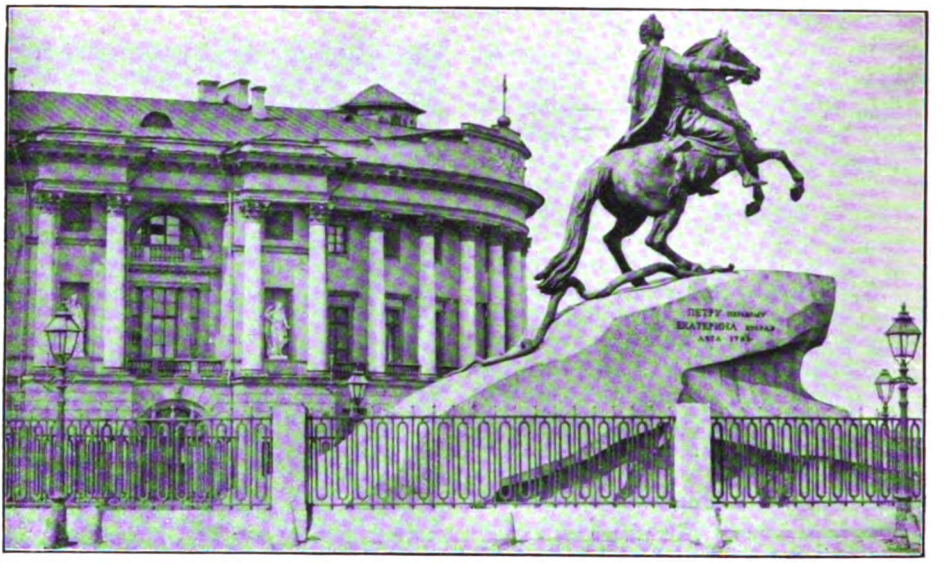

EQUESTRIAN STATUE OF PETER THE GREAT, IN ST. PETERSBURG.

Leaves from the Log of a Locomotive Engineer [No. XV.].

By ROBERT WEATHERBURN.

FORCE MAJEURE.

A MAN'S truest and best policy in life is to make the best of circumstances. This has been written and implied hundreds of times. Brute force is the *force Majeure* in Russia more than any other country. The same rule held good to even a greater extent in the building eras of ancient Egypt, as also later among the Aztecs and Peruvians, and it is ever associated with autocratic and despotic forms of Government. In order to accomplish an out-of-the-way task, it is customary to place unlimited bone and muscle under the control of some leader, for the time being invested with irresponsible power, to manufacture or build some colossal object, be it statue or bell, and out of all proportion to the end sought, or utility gained. The gigantic rock that forms the pediment for the colossal equestrian statue of Peter the Great in St. Peterburg was brought over the Gulf of Finland in mid-winter, by an army of workmen. Nothing reliable is known respecting the details of this achievement, which, if consummated now-a-days, would be recorded in every journal, and estimated at its full value in skill, endurance, and material *

With no lofty sense of duty to stimulate him, the Russian peasant when judiciously handled, will, with his serf-like obedience, mould himself to any work, however arduous it may be Profoundly ignorant as he is, and apparently indifferent as to whether the result be attained or not, you have only to secure his confidence, to maintain his respect and fear, and he becomes a veritable human machine at your disposal To handle him successfully, it is also needful that his national characteristics should be understood —child-like in his simplicity one moment,

* There is another version respecting the huge granite pedestal, namely, that the block was found some few miles away near the Finnish village of Lacta. As the boulder weighed considerably over a thousand tons before being roughly dressed, its excavation and transport in the swampy surroundings must have been a most difficult task, but as the islands and adjacent lands on which St. Petersburg is built are destitute of granite, being boggy and swampy, and the fact that the granite used in the city has been brought from the Swedish side of the gulf, gives more credence to its Swedish origin. The equipoise of the statue is obtained by making the forepart as light as possible, and the hind part and tail of the horse almost solid by the addition of 10,000 lbs. of cast iron.

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cunningly, craftily suspicious, the next. When lifting or hauling heavy weights where co-operation is needed, the best policy is to select from among them one who can sing. Like the Italian, the Russian character is often leavened with the ability to improvise, as well as to sing, some theme which shall interest or amuse being selected. Such songs are always the prelude to combined efforts, and the chorus part, times the action. It is the "Heave ho!" and the pull, in a more extended sense, of the British sailor, with less of the pull, and more of the song. Hence great patience is needed, and the efforts are very intermittent and spasmodic.

The engines which we had to fit up on the rails at Vologda constitute a typical case. These had to be transported a considerable distance by road on sledges, to bring them to their destination. Horses are of no account for such work, for when they feel the dead inertia of a resisting load at starting, they ease back at the very moment that a combined pull is needed. Hence the advantage and necessity of manual labour for haulage, which can be better timed. The tedious journey as far as the banks of the Volga, the chief river of Europe, was completed, but the banks at this point were so steep as to cause us some lively concern. Meantime an unusual spell of mild weather had set in. Our first duty was to ascertain whether the ice was thick enough to carry us across, as the snow lying thickly overspread, might hide defective places where the under current was more than usually strong. Besides, the water had fallen since the surface had been frozen, so that the ice at the sides was suspended, or, in other words, false ice. This could only be ascertained by breaking holes through here and there. Then a broad pathway, some 16 ft. wide, had to be made from side to side of the broad river through the accumulated snow.

It was found that in certain places the heavy snow covering had prevented the ice from reaching a sufficient thickness to carry the narrow sledges we had provided for land transport. Others had, therefore, to be constructed capable of covering at least double the area, that is, where the heaviest loads were concerned. After some difficulty and delay, suitable balks of timber were obtained about 12 ft. in length by 12 in. square. These were fitted, one at either end transversely, into the leading and trailing horns, projecting equally on either side. Under each of these projections, a sledge was placed and firmly secured thereto with bolts, so that each boiler with frames and cylinders formed one complete piece rested on four sledges, thus covering a much larger area than the single sledges.

This work being completed and all in readiness, the difficulty of getting the somewhat unwieldy structure down the precipitous banks had to be considered. It was abundantly evident that they must be let down very steadily, otherwise they would break through the false ice. No neighbouring trees or other supports being available, we had no alternative but to make holes in the frozen earth, as hard as stone, our delving tools being sharpened iron crow bars, and the depth pierced over 6 ft. Into these holes, three in number, and aligned one behind the other, we fixed strong posts. As much as possible of the frozen pieces of earth were replaced, and the spaces filled in with water which speedily froze them as fast as though they had been hydraulically cemented. From this series of three posts, we managed, with the aid of ropes and blocks, to steady each in turn down the steeply inclined banks, and had the satisfaction to see them, after much surging, shouting and hauling, dragged safely across the bosom of the chief river of Europe. Success at times breeds contempt, for which one has dearly to pay, but which all comes in under the head of "experience" afterwards. Having, with difficulty, hauled them up on the opposite bank, it was decided in order to save time, to risk the last tender, mounted as it was on a very narrow sledge.

All went admirably until we arrived within a few feet of the Jaraslav side of the water, when, with spluttering and a crash, the ice gave way, and the tender partially disappeared from view. There can be no doubt that had we not had the hauling ropes up the bank at the time, and thus been enabled to take a quick turn round the buffer plate of one of the already transported engines, it would have slid into deeper water as the tender became filled. It took us a couple of days of vexatious labour and much bodily fatigue to make good our recklessness, but the lesson was a valuable one.

Our life was more or less an active competition against competing nationalities. American enterprise, after completing the celebrated Ross Winans contract with the Petersburg and Moscow Railway, was confined to small contracts in Southern Europe. English-made engines were almost the first in the Northern provinces. French interests in the form of Schneider of Creusot, and Guion of Paris, were well to the fore on

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many of the principal lines. The Germans, however, by means of their excellent commercial diplomacy, always managed to secure a goodly share of all orders. The well-known firms of A. Borsig and Schwartzkopf, of Berlin, used to boast that they never closed their books under 60 to 80 locomotives per year for Russia alone. Our relations with the French and Belgian firms were of friendly, honourable rivalry, but the Germans from the first considered our presence in that country as an intrusion, and this feeling of acrimonious jealousy, was fostered by the numerous German officials who were to be found in nearly every locomotive department on Russian railways. It would not be exaggeration to assert that every German on the official staff was more or less an active, if not a paid agent, of German commercial enterprise. If not an open, at least a covert opposition was shown to everything English, and this at times was productive of something more than friction. In justice to the German, it must be said that as a rule he is an admirable subordinate and a generous equal, but an intolerable superior. When exceptions are found, they are as noteworthy as they are few. Their haughtiness of demeanour when holding responsible positions was very provoking. Indeed, until the Russian Government inaugurated the bonus system for engines of home manufacture, they considered themselves as entitled to a monopoly, but the Russian at heart is no lover of the German, or the position would have been worse.

As it was the Germans occasionally pushed affairs to such a limit as to cause serious contention. This feeling was not always confined to railway matters, but showed itself on what should have been the neutral ground of social life. When residing at the Hotel de l'Europe, in Eydtkuhnen, a frontier town of Polish Prussia largely populated with customs experts, and where the French and Belgian engines were taken off their temporary wheels, or from large special girder-made trucks, to be placed on the 5 ft. Russian gauge, an incident of an exceedingly unpleasant nature occurred. The principal portion of the dining hall of the hotel was occupied by some officers of a Prussian regiment, who, daily, had someone or other as a guest. The table allotted to the three Englishmen was placed near to the buffet in a corner. On one occasion a landowner, Baron Kreidner, who formerly belonged to the regiment, was the guest. We had seen him several times previously dining with them. He was notorious for his hectoring and blatant style, but open-handed with his old colleagues, which on doubt made them tolerant of his arrogancy. We had no such feeling, and took no notice of the way in which he showed his apparent contempt of our humble table.

On this occasion the Baron drank heavily, and was especially noisy, which is something to say of the German dinner table. A new fass of the best lager had arrived, and the foaming seidels were in great demand. Something the waitress, a comely and smart damsel, had done, had upset his "majesty's" temper, and in a voice like the trumpeting of an elephant he ordered her to bring more seidels of beer. It unfortunately happened that a colleague had ordered three for our table a few seconds before, and the girl made the glaring mistake of supplying our demands first, and then proceeded to supply him. Whether he was unaware of our previous call or not I cannot say, but he distinctly told her, so that all could hear that he had a mind to fling the beer into her face. The waitress dared to expostulate when the contents of his seidel were flung deliberately in her face. All were startled, and his own friends no doubt annoyed at his loss of temper, but none had the manliness to utter a remonstrance. Not so with us, we at once bawled out "Shame! Shame!"

I shall not easily forget the towering figure, as he sprang from his seat, his face crimsoned with rage and fury. Pushing back his chair majestically he strode down the room until he faced our table, where he stopped, and demanded with a thick, almost inarticulate, but peremptory tone, "Who cried shame?" "I have," I cried. He at once stretched his ponderous arm across the table, grasped my shoulder with a force that too surely betokened the power and passion behind, and said "Come out." The fighting instinct latent in my nature flashed into being with the pain and indignity of his action. I knew every eye in the room was upon me, and further that, however much they reprobated his action, that their sympathy was with him. By virtue of nationality, title and profession, he was their representative—their champion. I wrenched his hand from my shoulder, sprang to my feet, pushed my way round the table, and confronted him. I have never failed to read the signs of menace in a man's eyes that precedes a blow, and

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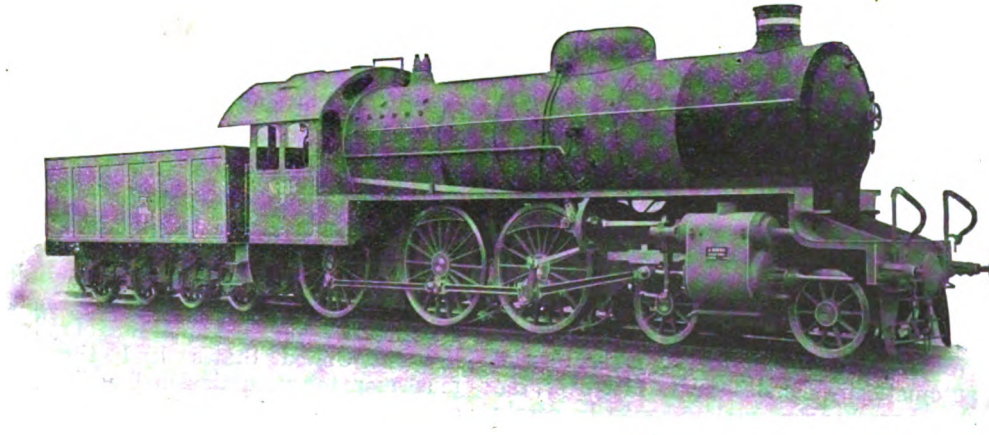
surely I saw it there and was prepared. "Du Verfluchter," he cried, as he dealt a swinging blow with all his might. But before his powerful arm could reach me, I smote him square between the eyes with my right, well home, backed with the full weight of shoulder, and felled him like a log at my feet. At that moment like a flash, I could not help but contrast the doubled-up and bleeding mass on the floor, with the stately, pretentious figure that half-a-minute before had stalked down the room.

Much had I heard, and some little had I seen, of Teutonic impassivity and phlegm. I am no longer a believer in such characteristics. The frenzied cries and imprecations that were showered upon me by his compatriots would have disgraced any assembly in the world. But he staggered to his feet, and without heed, skill or method, rushed like a maddened bull to his punishment, and he got it. For I had just succeeded in pushing a young interfering lieutenant aside, and caught him with my left again straight from the shoulder on the jaw as one of my colleagues afterwards said, that "sounded like a butcher felling an ox." That blow sent him sprawling backward among his friends with a crash. A roar of execrations followed that impressed me more than my conflict with him. But one voice I heard in English at once gave me heart—"Well done, old fellow, that's a slogger."

I never knew previously that I had in my nature so much of the resentful and combative before. I must do the Baron justice to say that even then the wild beast in his nature was not tamed, for, springing to his feet a second time, he rushed to the table, and seized one of the heavy-lidded and plated seidels which he hurled with all the force he possessed at my head. My friends told me afterwards that I just ducked in time, and the vessel striking the panelled wainscotting was smashed into many pieces. That was his last effort. His friends gathered round him, condoling and cursing in one breath. The landlord himself, an old soldier of the *Garde du Corps*, insisted on my going to my room, which I thought it policy to do. Our position after this occurrence was not an agreeable one with the military and their friends, and to avoid further trouble we timed our meals so as not to be in their company.

Some two years afterwards, I had again to visit Eydtkuhnen on business, and called on Herr Krause, the landlord. He appeared delighted to see me and my colleague, and, putting his arm through mine, said, "Do you remember this, my friend," pointing to a deep indentation in the panelling of the room where the seidel had struck. "Ah, but that was a dreadful day, lieber freund."

Mr. Weatherburn's next Contribution will appear in the January issue of the "Railway Magazine."



4-6-0 LOCOMOTIVE (SCHMIDT SUPERHEATER) FOR THE DANISH STATE RAILWAYS, BUILT BY MESSRS. A. BORSIG, OF TEGEL-BEI-BERLIN.

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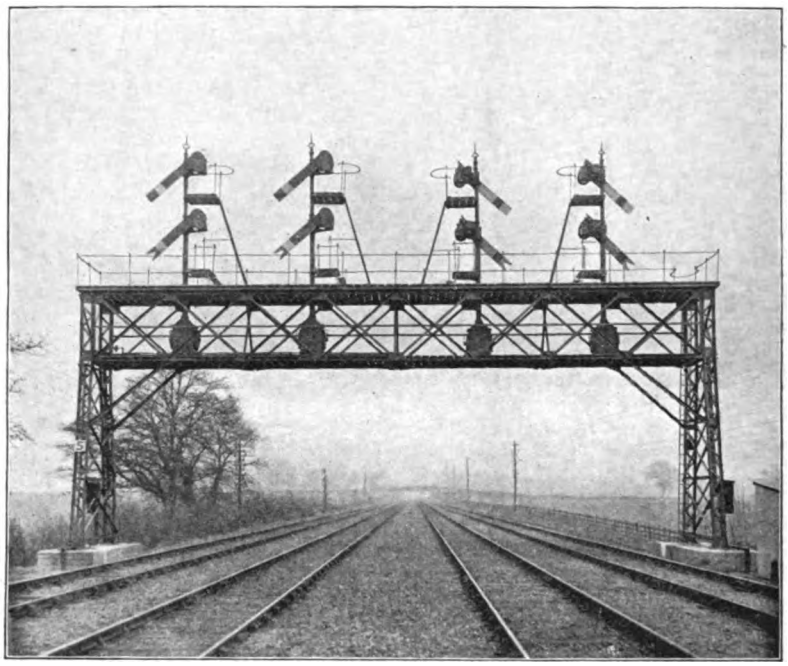

FOUR-TRACK AUTOMATIC SIGNALLING: LONDON AND SOUTH WESTERN RAILWAY.
British Pneumatic Railway Signal Co.'s System.

Automatic Signalling.

By T. PRESTON.

IN power signalling electricity, compressed air, or other agency replaces manual operation of signals and points, but except for the introduction of various possibilities which do not apply under ordinary conditions, the principles of signalling and the methods in vogue are not seriously altered. Automatic signalling, however, goes further, in that the trains signal themselves, and signalmen are not required except where and when points have to be operated. Many automatic installations are also associated with power working, owing to the fact that it is convenient and desirable to operate points and signals by power where they occur in connection with automatic plants, as is usually the case at junctions, where crossovers occur, and at terminal points on automatically signalled lines. Moreover, the actual mechanism employed may be nearly the same, whether applying to power or automatic signalling, the differences arising from the system and methods of control, by train movements, or under the direction of a signalman. There are many cases, too, where a " power " cabin can be switched out and trains worked past it automatically, the power frame being only brought into use when junctions and crossovers have to be worked.

The root idea of automatic signalling may be very simply expressed : the occupancy of a section by one train is employed to control the signals of the section behind, so that as the train passes along from section to section it causes the signals to be so operated that it is adequately protected, at the same time clearing the road for the following train progressively. The principle is a very old one, and it is not very clear whether the initial proposition has to be attributed to England or America, though the conditions of railways in the United States lend themselves much more to automatic signalling than is the case in this country, so that the principal developments which have made the idea workable are of American origin. Schemes were published and patented in both countries as far back as the 'sixties and even

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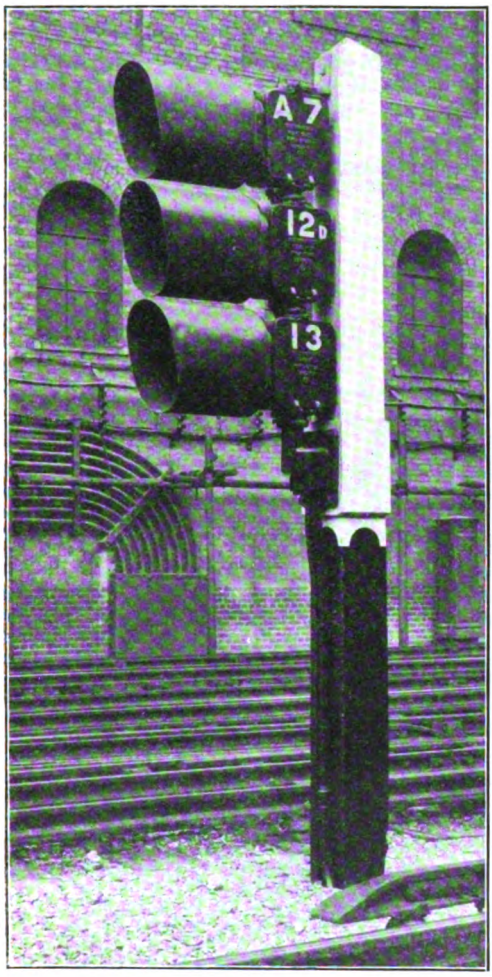

PLATFORM STARTING LAMP SIGNALS AS USED IN THE OPEN AT BAKER STREET, METROPOLITAN RAILWAY.
Westinghouse All-Electric System (alternating current type).

earlier, but these never got beyond the "paper" stage. The first successful automatic signals were tried in the United States in 1871, though they did not come into general use for many years after: these early signals were of disc form, and not semaphores.

In Great Britain, the first automatic installation to be brought into regular use was that on the Liverpool Overhead Railway in 1893, which is still in operation, though on a modified system. There were no more automatic signals in England till 1901, when, as a result of some of the London and South Western Railway officers visiting America, that railway laid down the British Pneumatic Railway Signal Co.'s system of low pressure pneumatic electric automatic signals on several long stretches (6½ miles two-track Andover to Grateley, and 24 miles four-track from Woking to Basingstoke) of their main line. Another visit to the United States was made in 1903 by several North Eastern Railway officials, and subsequently that company installed "Hall" automatic signals on a portion of their main line. With the electrification of the various underground and "tube" railways in London, automatic signals became essential to enable the increased and accelerated train services possible, so that it is on these railways that automatic signalling is seen at its best.

Before describing the various British automatic systems in greater detail, it would be well to consider the principles of automatic signalling generally, and see what its advantages and disadvantages are. To begin with, it is necessary to remember the differences between British and American railways, in order to explain why automatic signals are so widely used there. It is, in the first place, impossible to dispense with signalmen and boxes at busy stations and junctions, where points have frequently to be worked: automatic signals cannot be made to work points automatically also, though suggestions even in this connection are not wanting. In Great Britain, stations and junctions are close together; it is very rare for stations to be more than 10 miles apart, and as a rule they are very much nearer together; therefore, the number of intermediate signal-boxes, without points, is relatively small, and it is only these intermediate boxes which could be replaced by automatic signals. In America this is not the case. Long stretches of line without any stations or junctions are the rule rather than the exception, and so the railways lend themselves admirably to automatic signalling. Then, again, until comparatively recent years there was very little semaphore signalling in America; so that it has been easier to introduce "modern" apparatus. In other ways, also, conditions have been more favourable for the introduction of automatic signalling than has been the case here.

Further, in England all the lines have for many years been fully equipped with ordinary manual signals; and so if any section is fitted with automatic signals, the cost of the installations displaced has also to be taken into account. In America the railway companies have much more freedom; if they want to adopt a labour-saving

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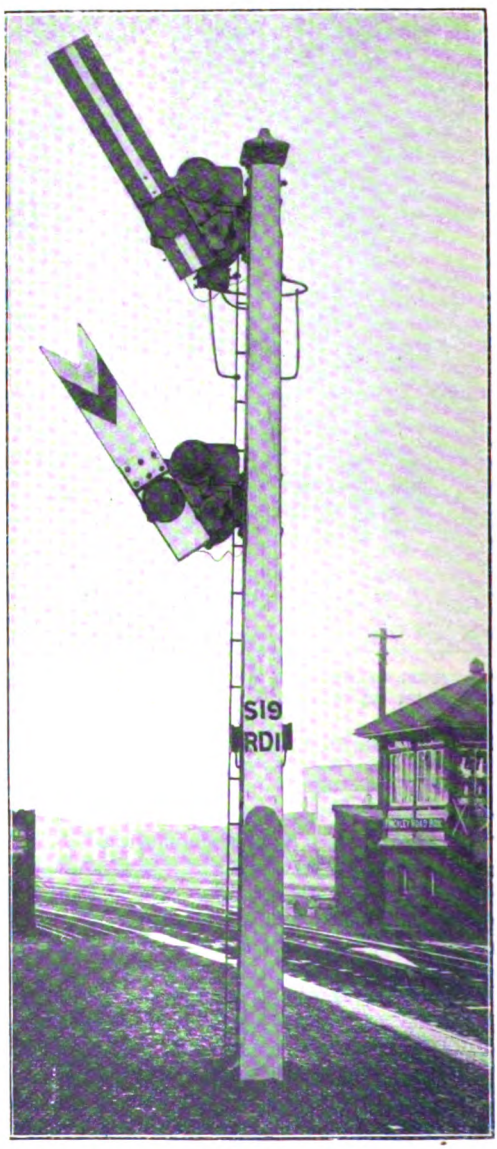
device they do so without consulting anybody, and if it proves dangerous and accidents result, they may have to pay compensation, but they do not abandon the device. In this country also, labour is cheaper, and it therefore requires a very considerable saving of signalmen's wages to balance the initial cost, and the expense of upkeep, of automatic signals.

The question of safety is also a vexed one. After any serious accident caused by a signalman's blunder, the non-technical press is always suggesting automatic signalling as a remedy; but as a matter of fact it is very doubtful whether, taking all things into account, automatically signalled lines are any safer though they are certainly no more unsafe. There are, indeed, several adverse factors which can be emphasised if one desires to make out a case against automatic signalling; but on the other hand, there is much to be said in support thereof. In fact, the case is overwhelmingly in their favour, given the conditions where they can show their value. For a line with a constant succession of trains on short headway it would be absolutely impossible to conduct traffic by ordinary methods. Signal-boxes could not be introduced in the numbers required to deal with the succession of trains which can be passed under automatic conditions; and on many underground lines there would be nowhere to put them even if their provision could be seriously considered. And the sending of the usual code signals and operation of levers and instruments would take far too much time, however expeditiously carried out. With automatic plant, however, the sections can be made as short and numerous as desired; there are no messages to be interchanged; and the moment a train clears a section the admission and repeater signals behind it are cleared, except for the overlap which is usually provided in the interests of safety.

In regard to main line signalling, too, the use of intermediate automatic signals enables long sections to be split up, and in many cases the objection that a signalman is not there to observe trains is somewhat nullified by the fact that he was not there before. Similar remarks apply in reference to the objection that a driver is permitted, after waiting a few minutes, to proceed although the signal may still indicate "stop." Were it not for the installation of an automatic signal trains would frequently be held at the previous "block" cabin, and if a driver does pass a signal as suggested he knows perfectly well the conditions under which he is doing so. On long stretches of main line automatic signalling can only be installed systematically where crossovers and junctions are very rarely used; but the trains are more or less under the eyes of station officials for observation purposes, and as a rule it is necessary to maintain every third or fourth cabin, although the others may be normally switched out. In such cases, indeed, the situation is very nearly the same as that of



UPPER-QUADRANT HOME AND REPEATER SIGNALS AT FINCHLEY ROAD: METROPOLITAN RAILWAY. Westinghouse All-Electric Automatic System.

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a main line where certain intermediate boxes are switched out, except that instead of the signals being virtually disused, they are still operative as regards trains travelling on the respective tracks and in the same direction.

Automatic signals are of two classes: "normal-danger" and "normal-clear." The former appear to be most advantageous, in that they conform to usual practice, and besides informing drivers of the conditions ahead, they indicate to platelayers and station officers not only that the road is clear, but also that a train is prepared for. "Normal-clear" signals show only the condition of the line and superficially suggest that there is nothing to safeguard against accidental failures and other adverse influences. This is not, however, the case in most installations. The mechanism is almost invariably designed so that any failure will cause the signal to return to danger independently of other factors. Although the normal position is "clear" they are, as a rule, arranged that the "clear" indication is given against the influence of gravity, so that in practice the condition is very nearly the same as that of "normal-danger." The objection that a continuous holding-off means is thereby entailed does not carry much weight in that the power is only small, and a line will hardly justify automatic equipment unless a considerable number of trains are dealt with. In some cases a mechanical clutching and declutching mechanism is employed to effect the actual holding-off, the electric current only being used to operate and release this device and move the arm from one position to the other.

HOME AND REPEATER SIGNALS (TRIPLE SPECTACLE DESIGN); SURREY DOCKS, EAST LONDON RAILWAY.
Westinghouse all-electric automatic signalling system (alternating current type).

It is, however, possible to adapt the "normal-danger" system in its entirety to automatic practice; but as a rule this involves more elaborate electrical connections, as an approaching train must operate the signals ahead—under the control of signals behind the preceding train—as well as protecting itself against the following train. In practice it may be said that nearly all important installations are "normal-clear," with the provision that any failure must show danger; and as drivers are well aware that they are dealing with automatic signals it is found that there is very little in the objection to "normal-clear" signals.

In both the "normal-danger" and "normal-clear" systems, each distant arm works in conjunction with the home arm on the next post ahead; in effect, the home board when off says to a driver, "the section ahead is clear," whilst a distant arm says, "the next *two* sections are clear." On the underground lines in London the "distants" are usually replaced by repeaters. Generally these merely indicate the position of the next signal ahead, whatever its designation, and do not, as in ordinary "distant" practice, show a clear road through a series of signals under the control of one signal cabin. This is, however, a matter of policy rather than of practice, and it is a simple matter to make automatic "distants" correspond exactly with usual methods.

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Automatic signalling may be effected in several ways, apart from the means used for operating the signals. Contacts, treadle bars and the like along the track may be utilised, these being operated as the trains pass along; contact devices or the like may be placed on the train to co-operate with devices along the track, or track circuits may

AUTOMATIC DISTANT SIGNAL: LONDON AND SOUTH WESTERN RAILWAY.
British Pneumatic Railway Signal Co.'s System.

be employed. The last-mentioned is the one principally adopted. The British Pneumatic Railway Signal Company were responsible for some of the earliest installations of track circuiting on British railways. The track circuit consists of a section of railway divided from the adjoining portion by insulating block joints which replace the ordinary fishplates. Owing to the rusting of the fishplates and loosening of the bolts by wear, the electrical conductivity is not to be depended upon between adjacent rails in a section, and bondwires are used round the joint to make them continuous conductors of electricity. The track relay consists of a horse-shoe electro-magnet fitted with an armature carrying one or more contacts for making and breaking the various electric circuits for the control of signalling devices. The relay is rendered necessary because it is impracticable to operate the signalling devices from the

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track circuit direct owing to the low voltage which it is desirable to use on these circuits.

On the Underground Railways (Westinghouse systems) one running rail constitutes a continuous positive conductor for the control current, the joints being bonded and the rails insulated, while the other rail is divided into sections insulated from one another, the intervening joints being bonded. The entrance of a train into a section provides a short circuit, causing the de-energising of a relay circuit, which breaks the signal circuit and allows the signal to move to "danger" by gravity. When a section of track has no train on it the relay coils are excited, owing to the potential difference between the (positive) continuous and sectional conductors constituted by the running rails, and a circuit is closed in the swinging coil, which is then attracted to one of the poles of the relay, and by swinging over completes the signal circuit concerned. For each block there are two relays, one at each end, and each closes a contact in the same signal circuit whereby the signal motor is allowed to act and move the signal to the "line clear" indication. As a train enters a section, the relays are short circuited through the axles, and, being de-energised, the circuit through the swinging coil is broken, causing the signal circuit to be broken at both contacts, with the result that the signal motor is released and the signal by gravity returns to the "danger" position." Track circuit systems have been extensively developed by the British Pneumatic Railway Signal Company and by the Westinghouse firms.

ELECTRO-PNEUMATIC SIGNAL CABIN AT CLAPHAM JUNCTION.
British Pneumatic Railway Signal Co., Ltd.

On certain railways where the running rails are used for the return of the power current, alternating currents are being used for signalling, as otherwise the rails could not be used for both purposes.

METROPOLITAN DISTRICT RAILWAY.

Here the Westinghouse electro-pneumatic system is used, as supplied by the McKenzie, Holland and Westinghouse Power Signal Co., Ltd. Compressed air at 65 or 70 lbs. per

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sq. in is used for operating the signals, with track circuits providing the electrical control. At junctions and terminal stations signal-boxes are, of course, provided, the signals, with the points, being power-worked on the Westinghouse system. In such boxes there are illuminated diagrams showing the state of the adjacent sections, and of the various roads.

An important feature of these installations whether "power" or "automatic," is that should a train over-run a signal at danger, the brake is applied automatically and the train brought to rest. This is done by a trip lever placed outside the track rails, which is raised when the signal is at danger. Should a train run past the signal, the crank is struck by a rod which opens the air valve of the brake and applies it to the wheels of the train. It may be mentioned that the automatic sections vary from about 300 to 1,300 yards. with overlap as required. In many cases signals have been added so as to create a kind of progressive overlap. In the tunnels, instead of semaphores, lamp signals are used with moving spectacles to show red (or yellow) or green. Lamp signals with red (or yellow) or green lights switched in or out are also used to some extent.

THE "TUBE" RAILWAYS.

The London Electric Railway uses the Westinghouse electro-pneumatic system, designed virtually as on the Metropolitan District, but with slight modifications in the construction of the signals to suit the special conditions. The Waterloo and City Railway has some semi-automatic signals for intermediate purposes of the lamp class. The greater part of the Central London Railway is now signalled automatically with Westinghouse electro pneumatic plant, using alternating currents for the track circuits, and the remainder of the line is now being similarly equipped. The East London Railway is signalled automatically throughout on the McKenzie Holland and Westinghouse alternating current all-electric system. On the Great Northern and City Railway a special system patented by Mr. R. P. Brousson, late Engineer of the line, is employed, the installation being put in under the supervision of Mr. A. H. Binyon, of Spagnoletti & Co. The signals are worked entirely by electricity, and consist of red and green incandescent lights, one above the other, and it is only possible for one of the two to be lit up at one time. There are no moving parts in the signals. The trains operate the signals by means of track circuits, but there is also a treadle fixed about 100 yards in front of each signal as an extra precaution, this treadle being struck by a "brush" on the last car of each train.

HALL "ELECTRO-GAS" AUTOMATIC SIGNAL: NORTH EASTERN RAILWAY.
Mr. Raven's fog apparatus can be seen on the nearer track.

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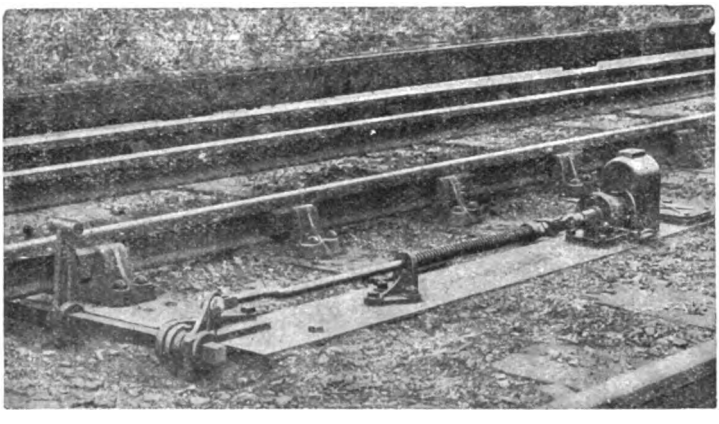
METROPOLITAN RAILWAY.

On this line the Westinghouse all-electric system is employed. This differs from the electro-pneumatic in that electricity is employed both for the operation and control of signals, but depends upon track circuits and in other respects is very similar to District practice. On the Extension line the signals are of "upper-quadrant" type, working upwardly instead of downwards. A very good case can be made out in favour of this practice, and further extensions may be expected. A portion of the Inner Circle line near Baker Street, as also the power installation at Baker Street station itself is now operated with alternating currents instead of continuous. Between Praed Street and South Kensington a rail contact system is used, with Sykes' "banner" signals.

LONDON AND SOUTH WESTERN RAILWAY: LOW-PRESSURE PNEUMATIC SYSTEM.

This installation was first brought into use in April, 1902, on the main line between Grateley and Andover, a distance of about 6 miles of two track line, and was so successful that an installation was put in between Woking and Basingstoke a distance of 24 miles of four track line; it is thus the longest piece of automatically-signalled main line in the country. These signals were erected by the British Pneumatic Railway Signal Co., of Westminster, and are on the "normal clear" system. The arms are operated by compressed air at a pressure of 15 lbs. per sq. in. A main air pipe runs alongside the line, from which smaller branch pipes lead to the signals themselves: the valves admitting the air to the signals are controlled by electro-magnets energised by the trains passing over the track metals.



TRAIN STOP: METROPOLITAN DISTRICT RAILWAY.

LIVERPOOL OVERHEAD RAILWAY.

This line was originally signalled on the system devised by Mr. I. A. Timmis. The signals were normal-clear and worked by long-pull electro-magnets. These magnets were not actuated by track-circuits, but by a contact, a lever by the side of the line being struck by a bar attached to the last vehicle of each train. When a train entered a station it put the home signal to danger behind it, and lowered the home signal of the station in the rear. When it left a station it placed the starting signal to danger and lowered the starting signal of the station in the rear. The current for working the signals was obtained from accumulators. This system has been superseded by one introduced by Mr. S. B. Cottrell a few years ago. In this system the signals are lowered electrically, and are held off and put to danger mechanically, hence the consumption of electric energy is very small, the current flowing only during the short interval occupied by the train completing the electrical circuit. Each train is fitted with four collector shoes, one on each side at both ends of the train. These shoes are connected by cables with one another and with the positive terminals in the two controllers, so that if any one or more of the shoes make contact with the conductor rails all the shoes are alive. The conductor rails, as a rule, are laid in the 6-foot way; the two shoes on the right-hand side of the train are, therefore, in contact with the conductor or positive rail, whilst the two shoes on the left-hand side of the train hang freely in the air. It is these "idle" shoes which are employed in the working of the signals.

On leaving a station the train passes the starting signal, and in so doing the "idle" shoe strikes a breaker-bar, which is insulated electrically from the structure and from the signal, but is connected mechanically with a trip rod leading up the semaphore arm in the "off" position. This pawl is then released and the semaphore arm goes to "danger"

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by dead weight, the spectacle casting being considerably heavier than the signal arm.

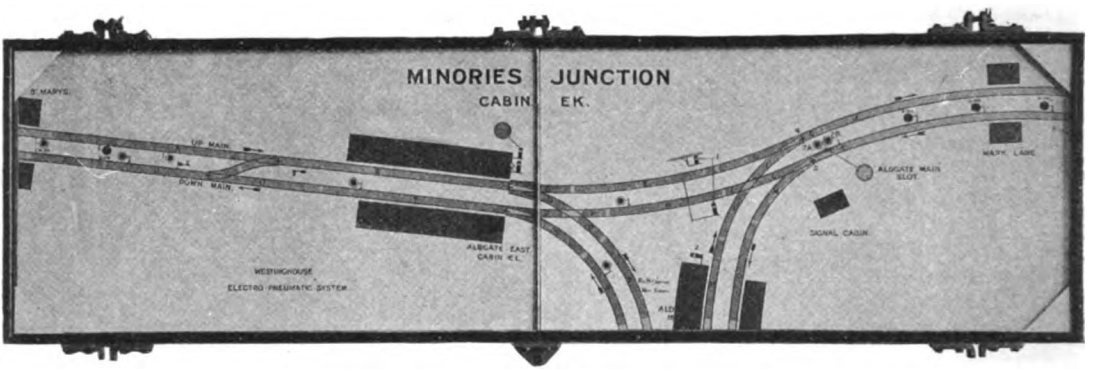
Each starting signal is fitted with a semaphore switch, placed in the electric circuit leading from the home and starter signals in the rear to the maker bar in advance. This semaphore switch is open when the signal to which it is fitted is in the "off" position, but is automatically closed on the arm going to "danger."

North Eastern Railway: Hall Electro-gas System.

This, the principal "normal-danger" installation in the country, was brought into regular use in March, 1906. It is in operation on 11 miles of the main line between Alne and Thirsk. This piece of line is split up into 15 automatic sections of about 1,200 yards each, and trains can be run at much closer intervals than was the case before, when there were seven ordinary block sections. An difficulties having now been got over, the installation is working extremely well and is a fine example of the principle. It has been stated that the automatic sections are usually about 1,200 yards long: this is thought to be too short a distance in foggy weather, and consequently when fog comes on, the automatic working is superseded by the ordinary block system, the signal-boxes being specially manned for that purpose.

Intermediate Signals.

The Great Western, Great Central, and Midland (London, Tilbury, and Southend section) Railways have a few isolated automatic signals, the first-mentioned between Pangbourne and Goring (Westinghouse all-electric), on the Great Central in Woodhead Tunnel, between Whetstone and Ashby Magna, and between Bulwell and Annesley (British Pneumatic Co.'s electro-pneumatic and all-electric equipments),



ILLUMINATED DIAGRAM: MINORIES JUNCTION.

"overlap" of 400 yards is used, which means that before a home arm will come "off," the section ahead must be clear, and also 400 yards of the next section: this is to give an additional margin of safety. The signals are of the Hall pattern, the arms being raised and lowered by carbonic acid gas; this is admitted to the signals by the energising and de-energising of electro-magnets as in the London and South Western signals, controlled by track circuit relays. The post is in reality a steel tube, up which run the rods which actuate the semaphores. The upper part of the base contains the operating mechanism, and the lower part of the base holds the batteries and relays. The carbonic acid gas is contained in large cylinders sunk in the ground to prevent freezing.

When first erected, the North Eastern automatic signals gave a certain amount of trouble through failures, though these were never such as to cause danger; but these and between Upminster and Pitsea (Westinghouse all-electric). These are all installed for the purpose of splitting up block sections which would otherwise be unduly long.

On the London and South Western, and to some extent on the Great Central, the signals can be used either as "automatic" or "power" under the control of the signalmen, this being necessary as the conditions of main lines are involved with, in some instances, crossovers and junctions to be worked at times. In other cases, as on the Extension line of the Metropolitan Railway, the signal cabins are retained, or some of them, and when needed the signalman can break into the automatic system, working either by power or manual agency, under his own control for the time being. There are also a few other automatic signals in use, as on the Lancashire and Yorkshire Railway, where Westinghouse electro-pneumatic apparatus is used.

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CURZON STREET GOODS OFFICES.

L. & N. W. Railway Goods Facilities in the Birmingham District. (No. I.)

By D. H. F. MEACOCK.

BIRMINGHAM, the metropolis of the Midlands, is intimately connected with the pioneer efforts of the railway engineer. It was here that the London and Birmingham and the Grand Junction Railways met, and provided a means of expeditious communication from London through Birmingham to Liverpool and Manchester and other large towns in Lancashire. It is common knowledge that these railways, together with the Liverpool and Manchester Railway, now form part of the London and North Western Railway system. Immediately following their advent, came a wave of prosperity, which has been of inestimable value to the commerce of the whole country. Birmingham, in particular, benefited by the new transport facilities, which provided the manufacturers of that city a ready means of communication with the seaports of London and Liverpool.

Although the passenger traffic of this hive of Midland industry is by no means inconsiderable, it is the carriage of Birmingham's goods and merchandise traffic that presents the greatest problems to the railway companies, and it is with the goods side that I here propose to deal. Although Birmingham is also directly served by the Great Western and Midland Companies, a glance at a railway map will show that the London and North Western Railway Company have been particularly businesslike in constructing lines of railway that encircle the city, thus enabling through traffic to avoid the congested areas and also provide a means for establishing a cordon of goods stations convenient for the requirements of manufacturers and others either in the north, south, east or west of the city or in Greater Birmingham. The London and North Western Company have goods stations and wharves at Curzon Street, Aston, Monument Lane, Witton, Soho Pool, Hagley Road, Harborne, Adderley Park, Vauxhall, Erdington, Chester Road, Stechford, and Perry Barr.

Curzon Street station—the headquarters of the Birmingham District Goods Staff—naturally holds pride of place. Originally the terminus of the London and Birmingham

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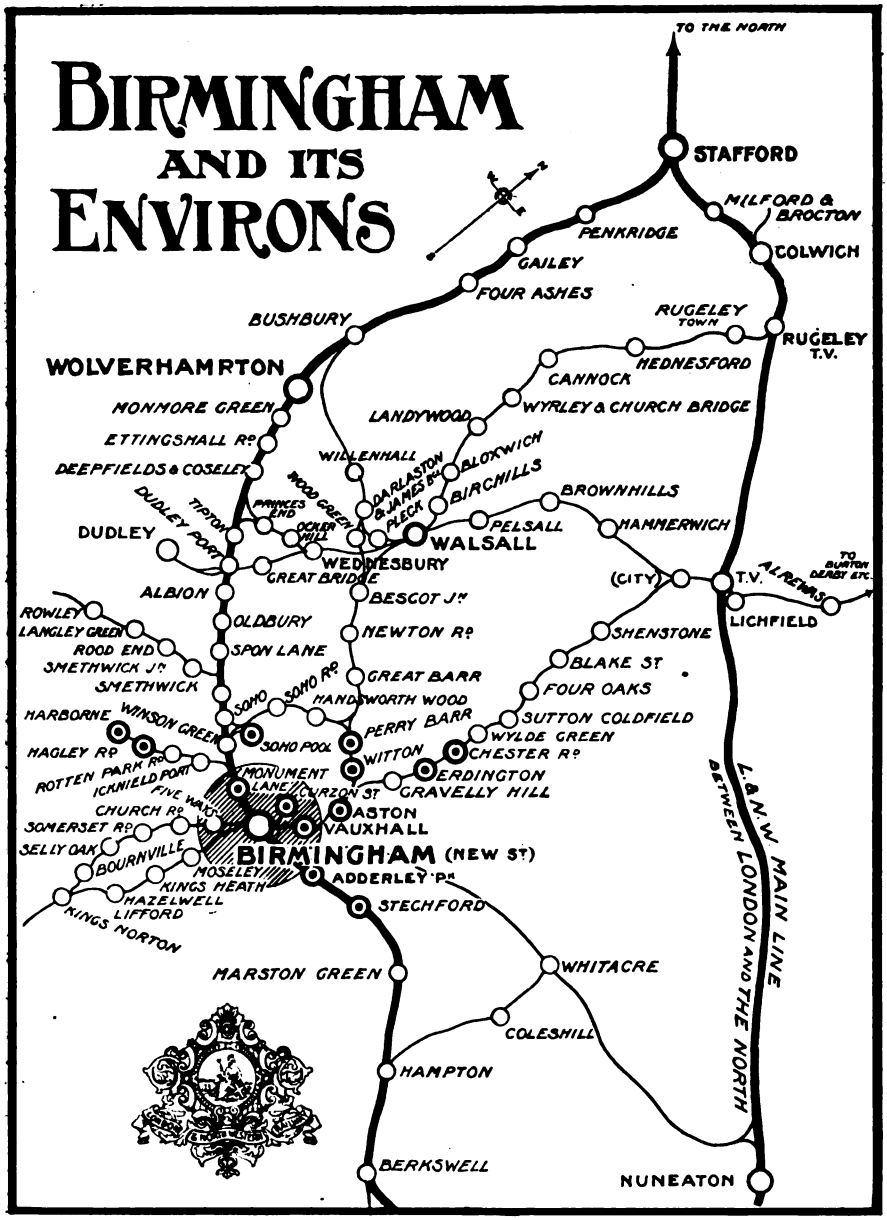

THE L. & N. W. GOODS DEPOTS IN GREATER BIRMINGHAM ARE MARKED THUS ⊙

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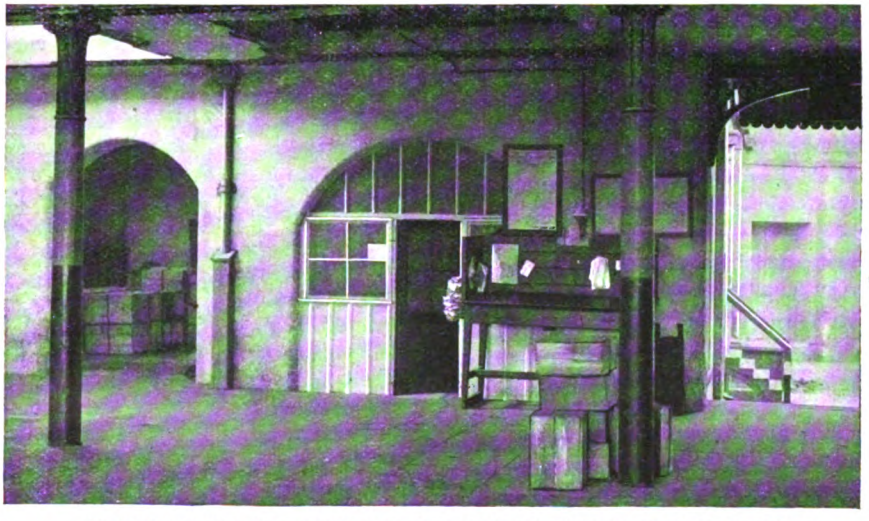
Railway, it was used as a passenger as well as a goods station. Demands for the accommodation of goods traffic, however, played havoc with the ideas of the original builders, and Curzon Street is now concerned with goods traffic only. The imposing station building, with its familiar portico of four Ionic columns, was originally the Queen's Hotel. It cost £36,000 to erect, and had the honour of accommodating Queen Victoria for one night on the occasion of her first visit to Birmingham. The massive stone blocks, which form the basis of the columns, each weigh 18 tons, but the handsome iron gates originally fixed have been removed, and may now be seen at the Stephenson Place entrance to New Street station. It may interest the passer-by to notice that they still carry the original coat of arms allotted to the London and Birmingham Railway, the arms of the City of London and the town of Birmingham being incorporated on one shield with the title, London and Birmingham Railway, shown on a ribbon. The old passenger platform and waiting-rooms remain, although the platform has, of course, been raised to suit the requirements of goods traffic. One waiting-room in particular is worthy of notice, surmounted as it is by a handsome glass dome, which while compatible with the passenger station of years ago seems strangely out of harmony with the present surroundings. The coffee room of the old Queen's Hotel provides spacious office accommodation for the staff of the goods agent, and the remainder of the building is used as offices for Mr. J. G. Humphreys, the District Goods Manager for the Birmingham District.

It has been said that Birmingham is the home of 999 different trades. Stupendous as the figure at first appears, a glance at the work of Curzon Street station would be sufficient to convince the most sceptical that there is no exaggeration in the claim. It is a characteristic of this station that it is called upon to handle on a very heavy scale, merchandise of a most varied kind. Nearly 2,000 men are employed, as well as about 600 horses, and the work of the station at any hour of the day or night presents an animated scene of activity. It is, indeed, week in week out, "alive" from 3 a.m. on Monday morning until 12 midnight on Saturday. For a brief space on Sunday and on a Bank Holiday only the great station slumbers, and at such times, when the rattle of chains and the rolling of wheels are not heard, the lull in this scene of activity is so weird that the stillness seems almost uncanny.



WAITING ROOMS AND PLATFORM, OLD LONDON AND BIRMINGHAM RAILWAY CURZON STREET STATION.

The station is equipped with the most up-to-date appliances for handling traffic of every kind. No fewer than 54 cranes (including one lifting 20 tons) are in use, and nearly all the shunting is done by means of hydraulic capstans. There are 26 turn-tables worked by these capstans, which are conveniently arranged in front of the main shed, enabling the staff to feed expeditiously the

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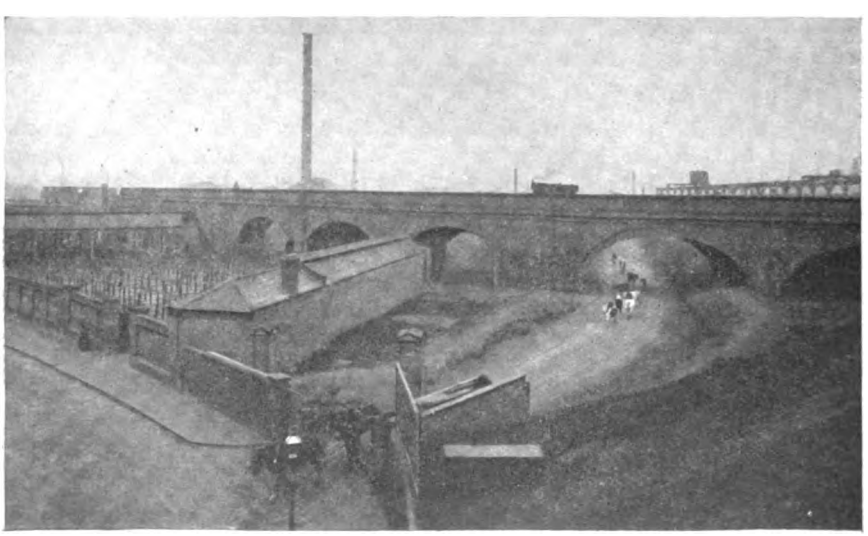
CATTLE LANDINGS AND PENS, CURZON STREET STATION.

loading decks with empty wagons, and to clear away full loads or *vice versa*. Here is handled the whole of the traffic for the Birmingham markets so far as the London and North Western Railway is concerned; and as early as 4.30 a.m. on any week-day it is not unusual for a large number of horses to be engaged delivering fish, fruit, meat and other perishable traffic intended for the same day's market. The fish traffic dealt with is very considerable, and is received principally from Grimsby, Hull, Fleetwood, Yarmouth and Aberdeen.

During the season large quantities of mackerel arrive from Ireland *viâ* Holyhead, and naturally this class of traffic calls for the immediate and special attention of the delivery staff in order to secure the early market. Huge consignments of vegetables also tax the energies of the staff daily. Another class of traffic arriving in large quantities, and calling for expeditious handling, is butter. It is not unusual for a special train load of butter to arrive early on Monday morning. So quickly is it handled, by the staff that, within a few minutes of arrival it is transferred to the waiting delivery vans, and is on its way either to the market or to the numerous provision merchants in the city. Mention should also be made of the special consignments of rolling stock from the busy works of the Metropolitan Railway Carriage, Wagon and Finance Co. These are despatched from



STATION TO CATTLE MARKET, CURZON STREET STATION.

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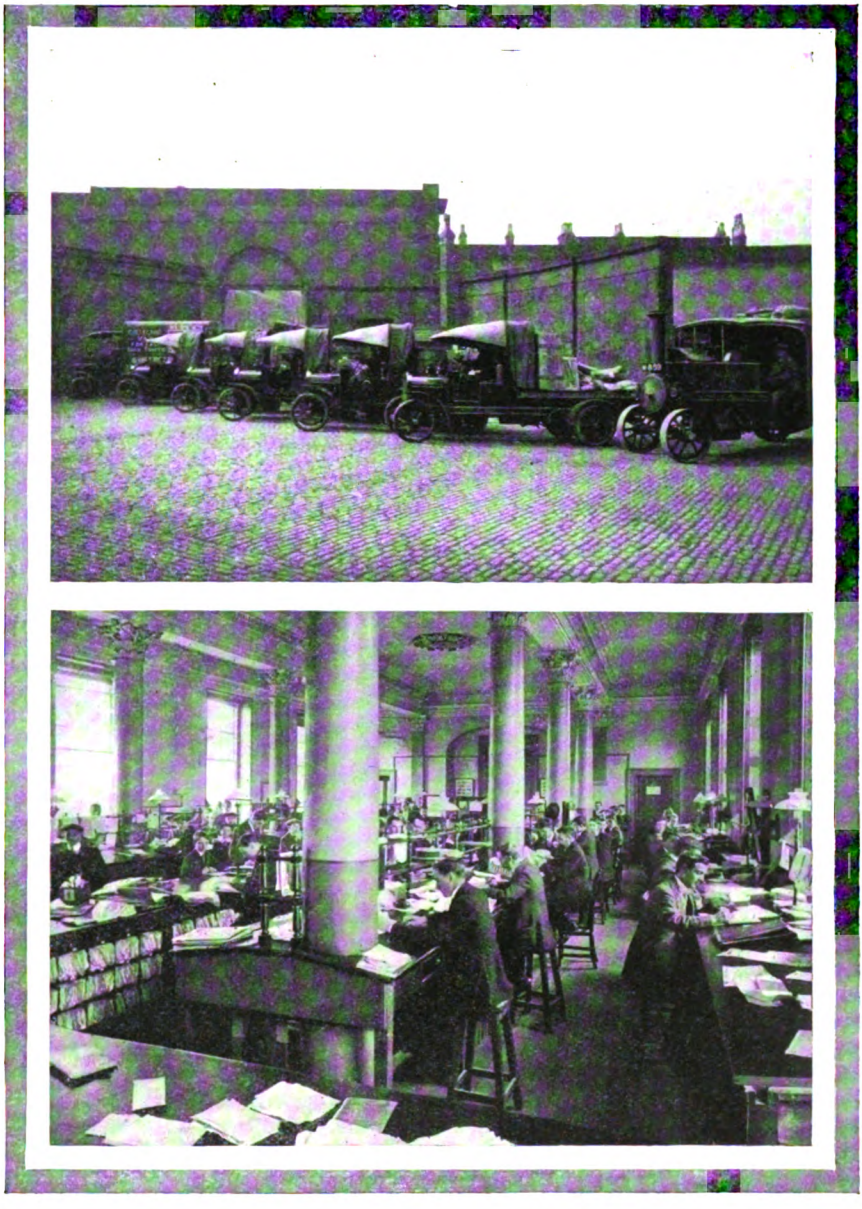
Curzon Street in large quantities, and, by reason of their weight and bulk, they often present difficult problems to those whose duty it is to load them.



MOTOR AND STEAM LORRIES FOR COLLECTION AND DELIVERY OF GOODS.
ONE OF THE CURZON STREET GOODS OFFICES.

Perhaps the most interesting portion of Curzon Street station is the shed where huge quantities of some of the most valuable metals of the world are consigned and stored. Metals from America, copper from Japan, cases of tin plates, bales of brass and copper filings (some weighing as much as a ton) and scrap metal (other than iron) are here collected from all parts of the globe for re-melting; and, doubtless, in many instances they are destined in a re-made form for despatch again to distant lands. The value

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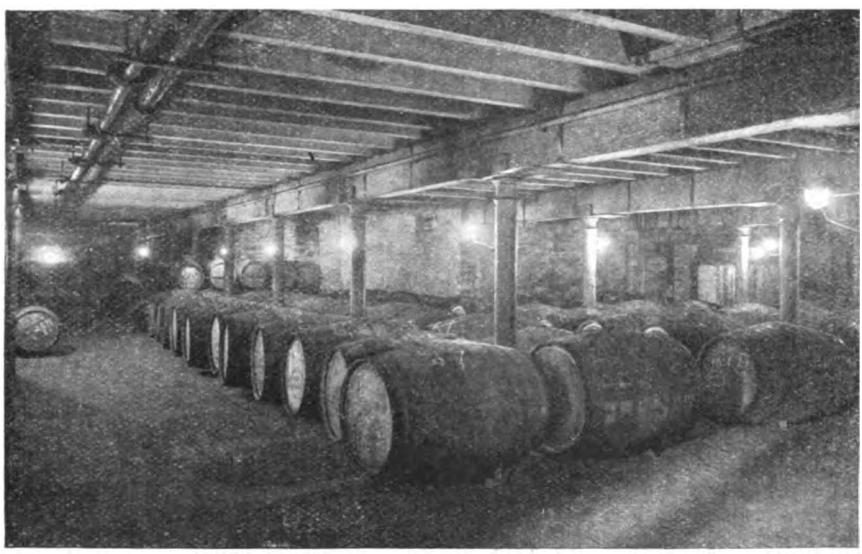
of the metals stored is very high, and the writer learned when he was privileged to inspect the shed recently that the estimated value of the metal then stored was something like a quarter of a million pounds sterling. It is impossible to convey in a few words an idea of the vast conglomeration to be found in this shed, but it ranges from ship's plates, brass and copper engine tubes and boilers to telephone wire, bosses of wagon wheels to old lamps; stacks of copper ingots, cases of tin plates, stacks of crude copper and of spelter, and barrels of brass dust, and so great is the demand for accommodation of this class of traffic that the metal shed has recently been considerably enlarged. A necessary adjunct to this large and important traffic in what is known as the "Top Yard." The Top Yard, it should be mentioned in passing, is divided from the main station by the street known as Curzon Street, and a level crossing, with three sets of rails, provides a connecting link with the station proper. The services of a gateman are employed to warn passing street traffic when it is proposed to shunt vehicles across the thoroughfare, and a notable feature of the crossing is the exceedingly long gates, four in number on either side of the road, which, owing to the angle of the crossing, are necessary to close the station yard from the roadway. Each gate weighs about one ton, and is fitted with roller support. The respective pairs each span a distance of 88



BONDED STORES, CURZON STREET STATION.

station is a commodious motor garage, where the Company's fleet of 10 motor lorries and one heavy steam motor lorry are housed. These motors are shortly to be increased in number. There is also a hydraulic power house, where current is created for working the capstans and a refuse destroyer where the sweepings and waste packings of straw, etc.—which would assume large proportions were they not quickly disposed of—is destroyed. Sometimes as much as five tons of refuse are dealt with in a single day.

Curzon Street station, having a direct access to the markets, is called upon to handle large quantities of vegetables, and special accommodation is provided for this feet. In this portion of the station a shed is set aside entirely for the storage of onions, and in the same corner of the station is a wagon sheet repairing shop, where a special contrivance has been erected for inspecting the sheets to ascertain whether they are watertight. This shed was the home of the stationmaster in the days of the Grand Junction Railway. Here also large quantities of paper for newspaper printing are stored, and close by is a sanatorium, where sick and injured horses are nursed back to health. Stabling is provided for over 200 horses, in addition to the accommodation for those employed in the work of the station. Some of the stables are two-storied buildings, and access

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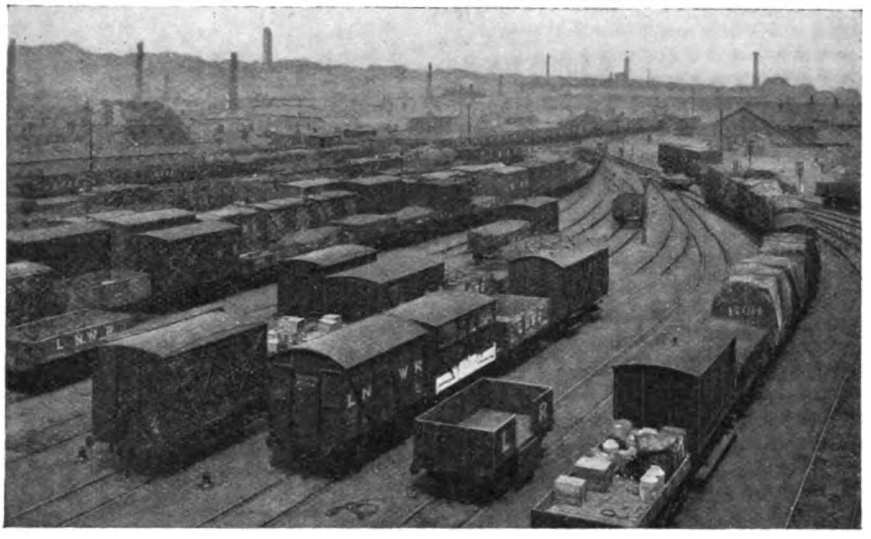

GOODS YARD: ASTON GOODS STATION.

to the upper floor is gained by a long incline up which the horses easily walk. In an adjoining building the provender for the large number of horses employed over the entire London and North Western system is cut up, packed in sacks and despatched. Considerable care has been exercised in providing appliances to deal with an outbreak of fire, and the staff are given special facilities for making themselves efficient in the use of fire appliances. The whole of the basement of the main shed is devoted to a bonded store, and an accompanying illustration gives a general idea of the spacious accommodation provided.

Lovers of railway relics would find considerable food for reflection by a visit to the platform which served as the terminus of the London and Birmingham Railway. This platform was originally built up to rail level only, but it has now been raised to serve as a loading deck. The quaint building is now utilised as a fruit store; and, instead of the old-fashioned open carriages, with luggage packed upon the roof, and guards in tall hats perched high up on the rear coach, one finds the modern goods wagons from which daily are discharged cases of apples, bags of nuts, boxes of lemons, barrels of grapes, cases of figs, dates and many other like provisions to supply the markets of the great city, of Greater Birmingham and of neighbouring towns.

Still to be seen here is the old station bell, with its unshapely and rusty spring, all in an advanced state of decay. One may easily imagine that its clangings were once the signal for considerable commotion at this important terminus, inasmuch as it announced the arrival or departure of the latest transport marvel—a locomotive capable of "flying" along at 20 miles an hour! Many a slumberer in the waiting room—which can still be seen on the platform—was, no doubt, warned that he must bestir himself if he would take the London express, which was to transport him to the great metropolis in a little over six hours—a striking contrast to the famous "two-hour" flyers of to-day! A halo of romance seems to surround the old bell, and it is surprising that such an interesting link with the past has not been promoted to an exalted position in some railway collection. A few yards away there is also the case of the old station clock. Face and works long since disappeared, and there is a vacant, neglected appearance about the carcase that is almost pathetic. The clock seems to say, "I am practically the only relic of the old railway left. All my colleagues have been taken away as souvenirs, or purchased for museums in different parts of the world, while you, in this parent country, have no railway museum where interesting relics might be housed."

(To be continued.)

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London and South Western Railway.

ELECTRIFICATION OF SUBURBAN LINES.

WE are officially informed that work in connection with the London and South Western Railway Company's scheme of electrification of their suburban lines has been commenced at Teddington. The power house will be situate at Wimbledon, adjacent to the main line. Excavation in connection with the foundation was commenced in July last, and is now well forward. The outer wall of the power house is completed to ground level, and the foundations will be sufficiently far advanced for the erection of the steel structure to be commenced at the end of this year. The building, consisting of two main bays forming a boiler house and turbine house, with a switch house attached, will be 260 ft. long by 210 ft. wide. A line will be constructed and carried on a viaduct from a point near Durnsford Road Bridge, up into the roof of the boiler house, from which coal may be dumped from wagons direct into bunkers over the central firing floor.

The boiler house will contain 24 boilers, each capable of a normal evaporation of 20,000 lbs. of water per hour, and supplying steam at a pressure of 200 lbs. per sq. in., with a superheat of 200° Fahrenheit. Coal from the overhead bunkers will descend through shoots into mechanical stokers driven by electric motors. Economisers will be fixed in the main flues for heating the feed water for the boilers.

When completed, the turbine room will contain six steam turbines coupled to 5,000 kilowatt three-phase alternators, which will run at 1,500 revolutions per minute, and will generate current at 11,000 volts. There will also be two auxiliary steam turbines, coupled through gearing to 400 kilowatt direct current dynamos for supplying power to the power house lights and auxiliary motors. The switch house will have three floors, and will contain all the switchgear for controlling the main generating plant and the outgoing feeders. Main oil switches will be controlled from a desk erected on a balcony on the first floor of the switch house overlooking the turbine house, and will be electrically operated. Below the turbine house there will be a basement which will contain surface condensers, with the necessary air and circulating pumps, together with ten hot wells and boiler feed pumps. A 40-ton overhead electric travelling crane will span the turbine room for overhauling purposes.

Current generated at 11,000 volts will be transmitted to nine sub-stations by three-core cables. These cables will be paper insulated, lead sheathed and wire armoured. They will in most cases be supported on posts beside the line, and will be so arranged as to afford a duplicate supply to every sub-station. Sub-stations will be erected at Waterloo, Clapham Junction, Raynes Park, Hampton Court Junction, Barnes, Twickenham, Kingston, Sunbury and Isleworth.

With the exception of that at Clapham Junction, the buildings will be 50 ft. wide and from 65 to 103 ft. long, and will consist of a machine bay and a switchgear bay. At Clapham Junction the sub-station will be located on No. 5 platform under the gangway leading to St. John's Hill, and this site will require a special arrangement of buildings and apparatus. Each sub-station will contain static transformers and rotary converters, together with the necessary switchgear, for transforming the three-phase high tension current to direct current at 600 volts, in which form it will be used by the trains. Two sizes of converters will be used, the larger having a continuous capacity of

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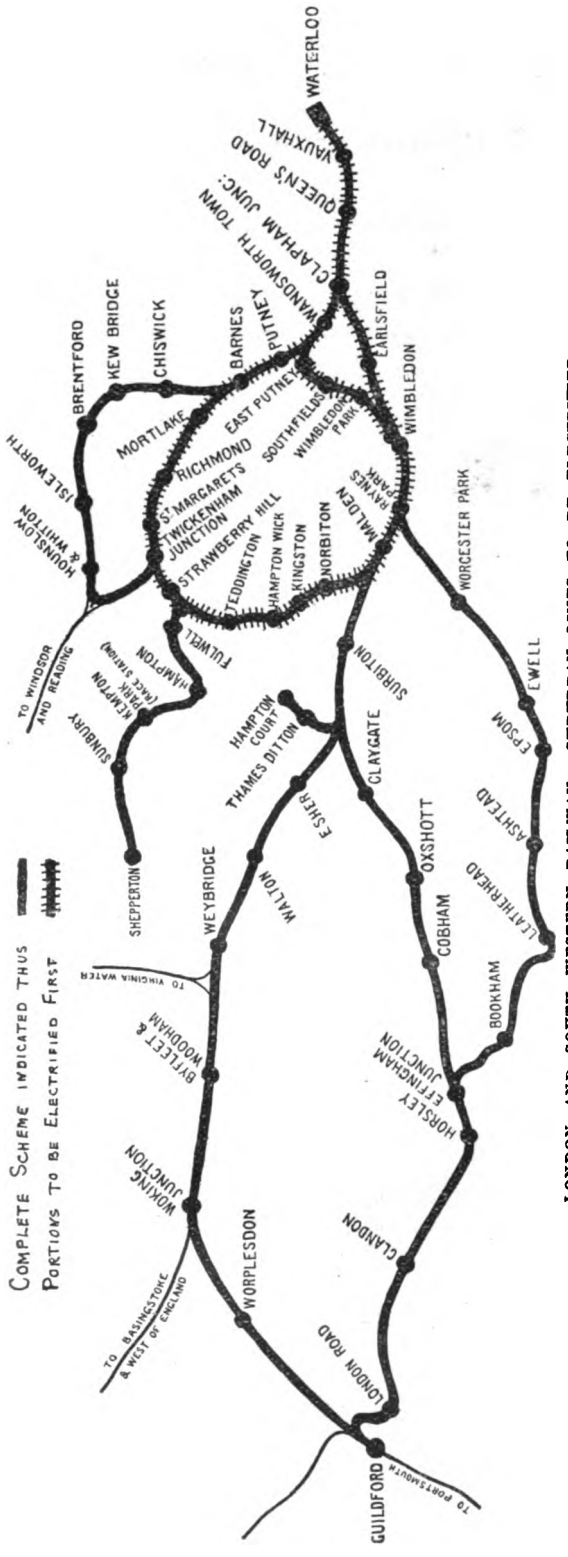

LONDON AND SOUTH WESTERN RAILWAY: SUBURBAN LINES TO BE ELECTRIFIED.

1,875 kilowatts, at Waterloo (4), Clapham Junction (3), Raynes Park (2), Barnes (2), and Twickenham (3), and the smaller, having a continuous capacity of 1,250 kilowatts, at Hampton Court Junction (2), Kingston (2), Sunbury (2), and Isleworth (2). From the sub-stations, direct current at 600 volts will be delivered to a conductor rail, laid along the line 16 in. from gauge, and at such a height that the contact surface will be 3 in. above rail level.

The rail, of which considerable quantities have been delivered, is of special steel having a resistance of about 6¾ times that of copper of the same length and cross sectional area, and weighs 100 lbs. per lineal yard. It will be supported by insulators fixed on the sleepers, and will be bonded across the joints by four flexible copper bonds expanded into holes drilled in the rails before delivery. Current will be collected from the rail by the trains by means of cast steel collector shoes hung from the trucks, and the return side of the circuit will be formed by the running rails, which will be bonded across the joints by two flexible copper bonds.

For the first section of the electrified lines, 84 train units are being provided. Each unit will consist of three compartment type coaches, and will be equipped with four motors, each of 275 horse-power, together with the necessary control apparatus. These motors will be the largest ever mounted on a passenger coach. A special motor truck, carrying two motors, will be fixed under each end of the train unit, the remaining trucks being of the company's standard pattern. The control apparatus will be of the relay automatic multiple-unit type, providing for uniform acceleration, and controlling from the front driving cab all the motors on a train of any length. Every train unit will have a driving cab, containing control apparatus for two motors at each end, two luggage vans and seating accommodation for 190 passengers.

New running sheds and repair shops for the electric trains will be built at Wimbledon, adjacent to the power house, and additional sheds will probably be provided at Hampton Court, Fulwell and Hounslow. It is the intention to commence electric working on the Kingston Roundabout line first, and it is hoped that this line will be in operation before the end of 1914. Electric services on the Hampton Court and Shepperton branches and on the Hounslow loop line will be added as soon afterwards as possible.

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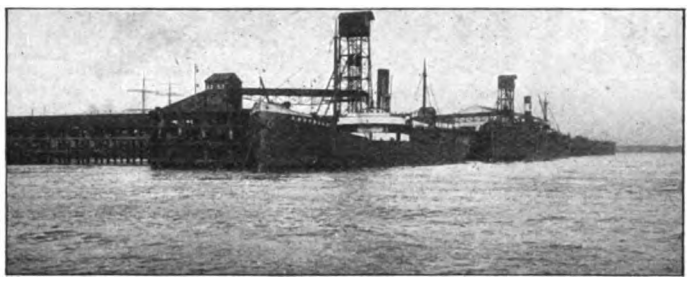
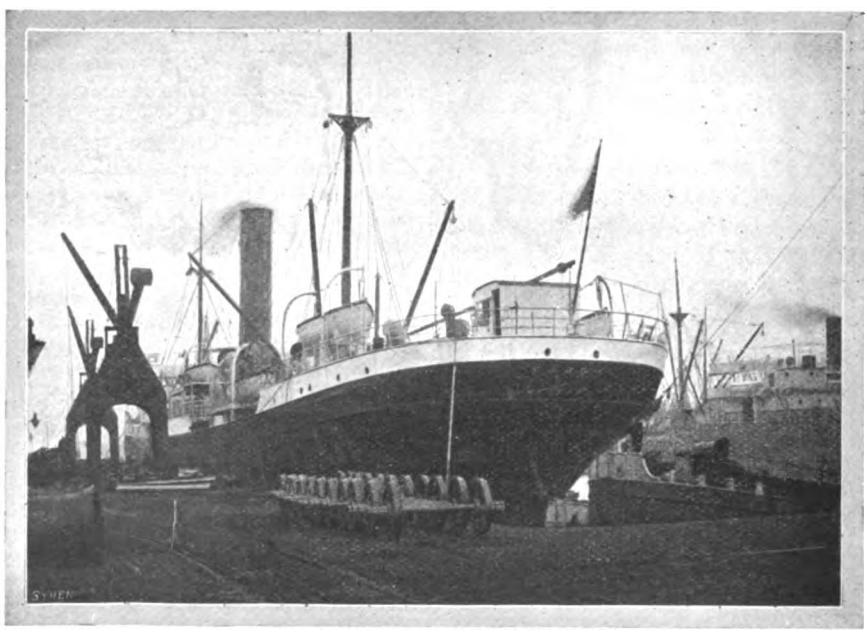
The Hull and Barnsley Railway and its Dock and Pier Facilities.



STEAMERS COALING AT THE ELECTRIC CONVEYORS
HULL AND BARNSLEY RIVER PIER, HULL.



R. M. S. P. "PARDO" LOADING FOR SOUTH AMERICA, AT THE ALEXANDRA DOCKS, HULL.
HULL AND BARNSLEY RAILWAY.

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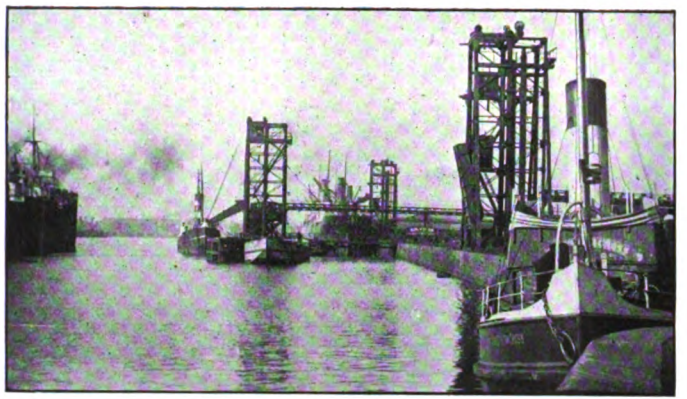
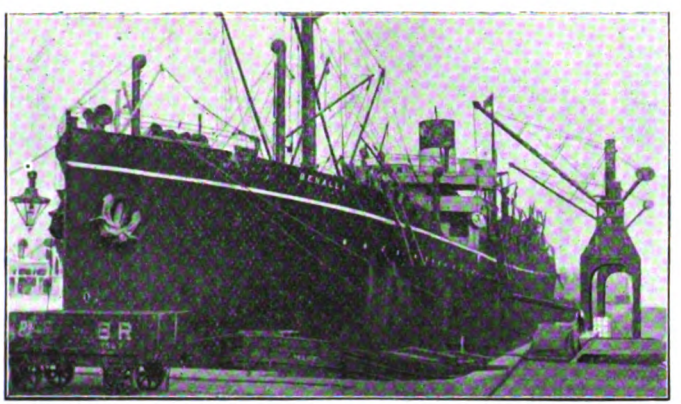
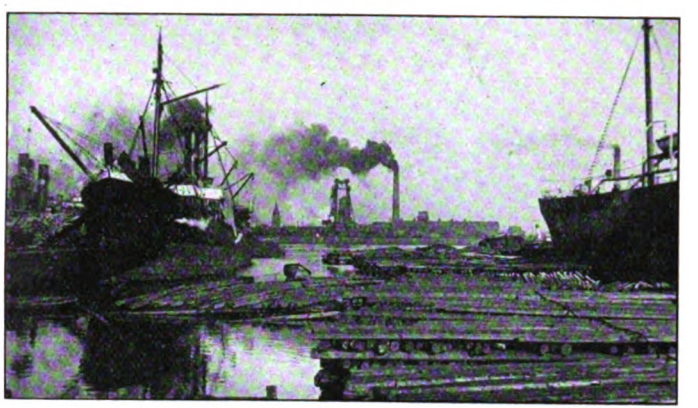


SOME OF THE COAL HOISTS.

DISCHARGING GRAIN OVERSIDE.



S.S. "BENALLA" (P. & O. BRANCH SERVICE) DISCHARGING AUSTRALIAN MEAT, RABBITS, WHEAT AND WOOL.



AT THE TIMBER JETTIES.

Scenes at Alexandra Docks, Hull. Hull & Barnsley Railway.

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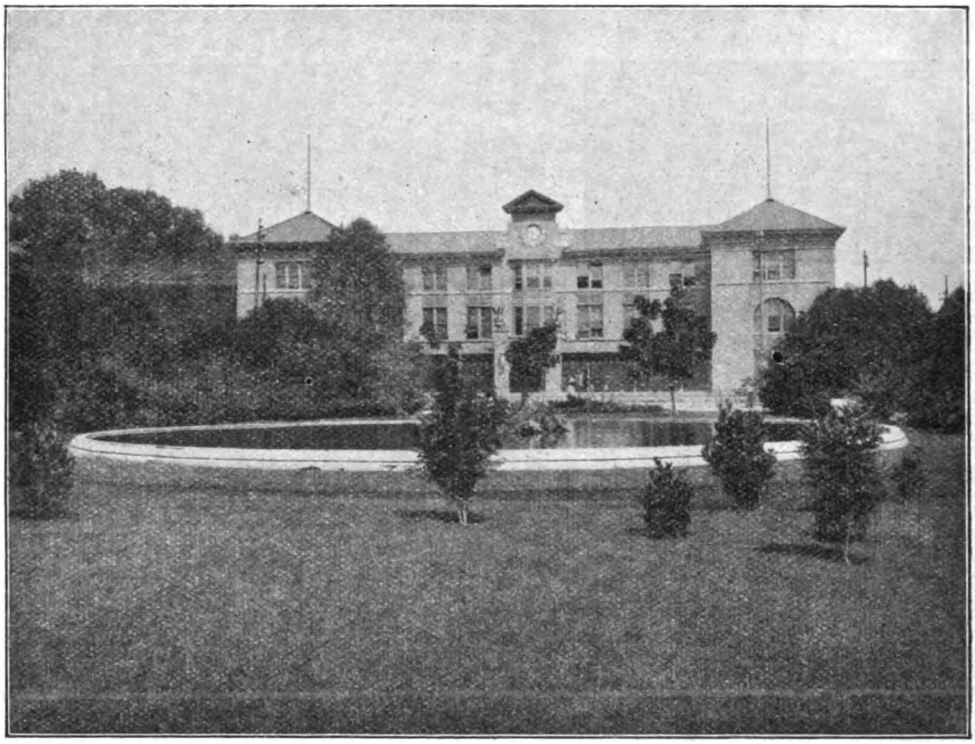

COLONIA STATION, MEXICO CITY.

Railway Construction in Mexico.

ON the Durango to Canitas branch of the National Railways of Mexico the rails have now been laid for a distance of about 86 miles, and in addition more than 30 miles have been graded ready for track laying. The total length of this line will be about 170 miles, and it is estimated that the branch will be completed and trains running over the entire distance in the early part of next year. Regular service over the completed portion has already been inaugurated, and daily mixed trains are running between Durango and Lo de Mena, Zacatecas—a distance of 80 miles. In the short time during which the new line has been operated freight and passenger receipts have been very satisfactory. Immediately upon the completion of the line through services will be started between Durango and Mexico City.

The line runs in a general South-Easterly direction from Durango to the borders of Zacatecas, and thence almost due East, to join up with the ex-Mexican Central Railway at Canitas. It passes through one of the most fertile and thickly settled agricultural districts of Zacatecas, and also a very rich mineral zone where, even now, thousands of tons of ore are being held pending completion of the line. With the exception of a few miles of hilly country, the construction engineers have encountered no difficult problems, and it is estimated that the average cost of the completed branch will not be much more than £2,400 per mile. A glance at a map of the Republic will show the enormous value of this line. It will furnish Durango with its long-needed short connection to Mexico City and other Southern points, and will bring the City of Durango 34 miles nearer by rail to the capital of the Republic than is Torreon. What this means to Durango (one of the most important cities in the Republic) and the surrounding country may be realised from the fact that at the present time all passengers and freight destined for points in the South of

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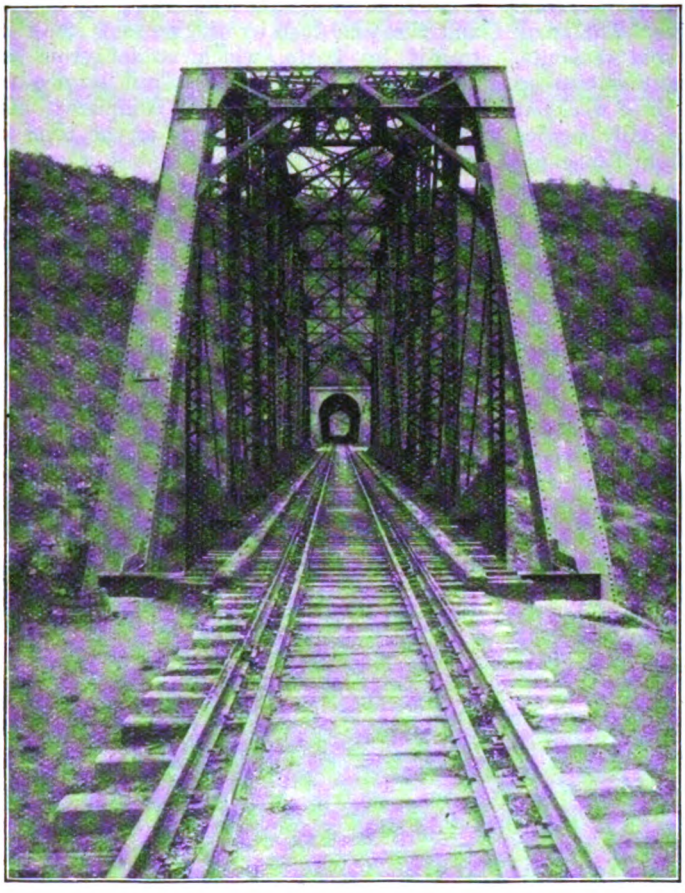

BRIDGE NEAR TUXPAN ON THE NATIONAL RAILWAYS OF MEXICO.

Mexico must first travel North-East to Torreon, 158 miles distant, before turning South.

Considerable progress has also been made on the branch from Durango to Llano Grande. A large steel bridge 700 ft. long across the Chico River, 35 miles distant from Durango, is already completed, and track laying has been commenced westwards. The line has now been completed for a distance of 53 miles from Durango City and only 12 miles short of the present proposed terminal at Llano Grande. The branch will tap a rich timber and mining country. Work on the important National Railways of Mexico branch from Matamoros to Veracruz *viâ* Tampico is still progressing steadily. The concession was granted to the Company by the Mexican Government in March, 1912. The Veracruz-Tampico section is to be over 300 miles long, and will have compensated grades of not more than 1 in 200, with maximum curves of 3 degrees, except on a section of about 20 miles over the "mesa" of Sanatepec. At this point, about 140 miles south of Tampico, the line will have an elevation of 1,300 ft. above sea level, with a maximum compensated grade of 1 in 50, the sharpest curves being of 6 degrees. On top of this "mesa" the branch line to Honey and to Mexico City leaves the main line.

Final location of this section has been completed. The first 63 miles south of Tampico, including a 1,600 ft. bridge over the Panuco River, is under contract, and the work is progressing rapidly. This section includes the petroleum districts of Mexico, also a timber and agricultural country only partially developed. The Tampico-Matamoros section will be about 255 miles long and will have a ruling grade of 1 in 330 with maximum curvature of 2 degrees. Preliminary surveys have been completed, and of the final location about 40 per cent. is finished. The Honey branch will connect the Veracruz-Tampico-Matamoros line with the central "mesa." Already the Company has a line from Honey to Mexico City. The new branch will provide a short route from the capital to the port of Tampico, and will be about 75 miles long from Honey to a junction with the Tampico-Veracruz line. It will have maximum grades of 1 in 50 and curves not exceeding 8 degrees. Above sea level the preliminary survey has been completed. About 275 miles will be laid with 85 lb. rails, and about 360 miles with 75 lb. rails. Native hardwood and American pine creosoted cross sleepers will be used. The work involves handling about 25,000 tons of steel bridges; constructing about 416,000 cubic yards of concrete masonry, and boring 22,960 ft. of tunnel.

A decided improvement can now be noticed along the entire length of the

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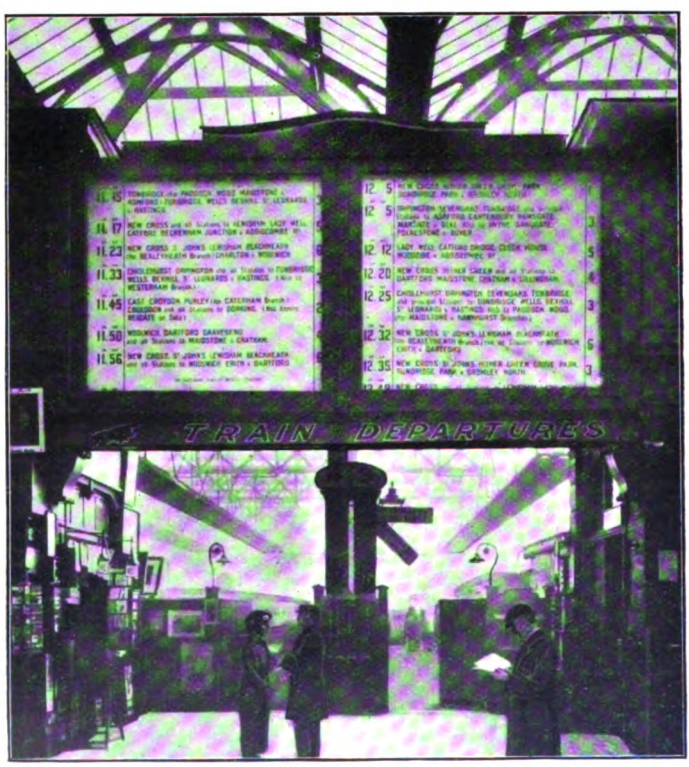
Pan-American Railroad, all of the large rivers being spanned by steel bridges. The track generally has been raised to avoid washouts, which in the past have sometimes tied up communications for two and three weeks at a time. Early last year the daily service put into effect made the run from Tapachula to Mexico City in 24 hours less time than previously, the trip now taking only 50 hours. From Tapachula to Mariscal, on the frontier of Guatemala, a tri-weekly service is maintained. The international bridge over the Suchiate River still remains as before, awaiting official permission for traffic. It would be a great convenience if it could be used, thus eliminating the bother and the time lost by the present mode of transit by boats, which is dangerous in flood time. The through rail service to Guatemala City is not yet completed, but the work on the other side of the river is being rapidly finished, so that it is only a two-hour journey on horseback between terminals, and it is expected that trains will be running before the end of 1913. This will mean much more traffic for the Pan-American Railroad, as undoubtedly the plantations near the frontier will export their coffee over this route.

Train Indicator at Charing Cross Station:

South Eastern and Chatham Railway.



Photo] [*Photochrom Co., Ltd.*

An improvement recently completed at Charing Cross Station, London, is the train indicator, above the main Continental Departure Platform, which is here illustrated. The indicator was constructed by the well-known sign experts, Messrs. Gawthorps, Limited, St. George's Sign Works, Leeds.

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Railway Engineering and Equipment.

Steam Heating Apparatus for Railway Carriages.

In the heating of railway carriages difficulties not encountered in the heating of buildings have to be overcome. One of these is that only one main supply pipe can conveniently be carried from the locomotive to the rear of the train. In consequence, the steam pressure at the rear, especially in the case of long trains, is less than that at the front, and, as the temperature depends on the pressure, the front carriages may be too warm while those in the rear are cold. Another difficulty is that the piping and fittings underneath the carriages, being frequently exposed, more or less, to severe frost, are liable to be frozen. Further, the carriages may be left in open sidings when not in traffic, and the temperature of the interiors may then fall below freezing point, in consequence of which, if the heaters and valves contain any water of condensation, they will also be frozen.

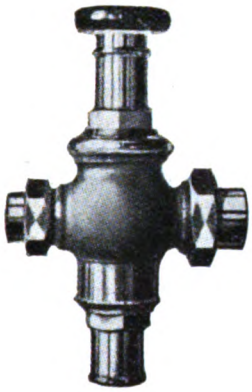

FIG. 1

These troubles were formerly a cause of much inconvenience and expense to railway companies, and, in order to obviate them, the Westinghouse Brake Company, Ltd., some years ago introduced the Westinghouse system of heating by steam at atmospheric pressure. So satisfactory has this system proved that its use has rapidly extended to many of the most important railways, not only in this country, but also in countries where the climatic conditions are among the most severe in the world.

In the Westinghouse system of heating, steam passes to the main heating pipe through a reducing valve (Fig. 1) on the locomotive, by which the pressure is reduced from that of the boiler to one which will ensure that sufficient steam reaches the rear of the train, the usual pressure being about 40 lbs. per sq. in. at the locomotive. The main pipe extends throughout the train, the type of coupling between the carriages varying in accordance with the standard practice in different countries. A separator and steam trap are provided to drain the main pipe of water on each carriage. The main heating pipe with separator and steam trap can be seen in Fig. 2.

A distinctive feature of the Westinghouse system is the heater, one form of which is shown in Fig. 3. This heater consists of a tube A provided with caps B and C. Steam from the branch pipe enters the heater by the inlet D on the lower side of cap C. E is a tube of special alloy having a high ratio of expansion, and is attached at one end to the socket F. At its other end is attached the valve G, for which the edge of the steam inlet forms a seat at K. The socket F has formed upon

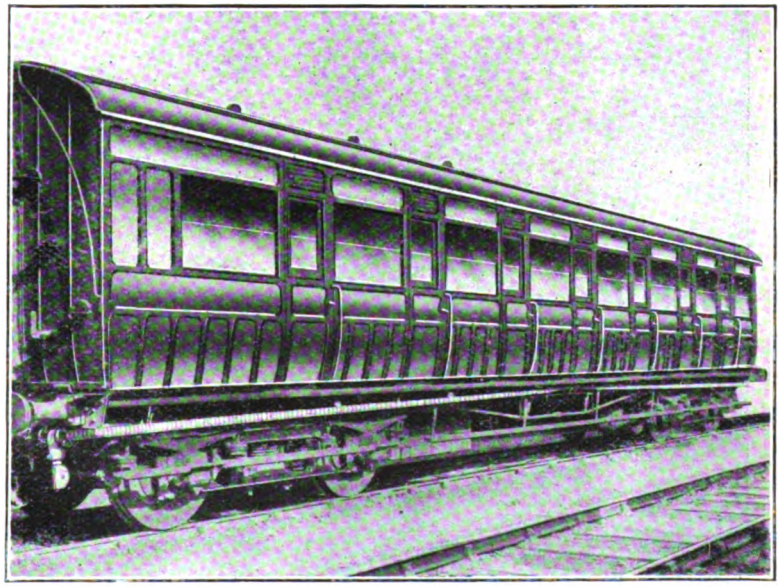

FIG. 2.

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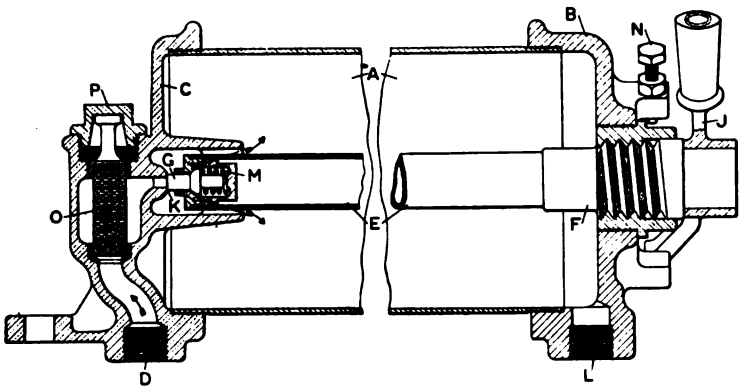

FIG. 3.

its outside a screw of large pitch, which works in cap B. On the end of the socket is fixed the handle J, by means of which the passenger can regulate the temperature of the heater. If this handle is moved up or down, it will be seen that, owing to the screw thread on the socket, the tube E, and with it the valve G, will be advanced towards, or withdrawn from, the seat K.

With the handle at the "on" position and the heater cold, the valve G stands away from the seat K, allowing a free passage for the steam, while the air and water of condensation escape by the outlet L. As the heater becomes hot, so does the tube E, which expands more than the tube A for the same rise in temperature. This causes the valve G to approach the seat K, and, when the tube E reaches a pre-determined temperature, the valve G closes the steam inlet and prevents further ingress of steam until the heater cools slightly, when the tube E contracts, and again allows the valve G to open and admit a further quantity of steam.

If the handle J be moved towards the "off" position, the valve G is brought nearer the seat K, and the steam is therefore cut off earlier, because the tube E has to expand less to bring the valve G to its seat K. If the handle is moved right over to the "off" position, as shown in the illustration, the valve G is brought on to the seat K, thus shutting off the steam, and as the heater cools down and the tube E contracts, the valve G is kept up against its seat by the pressure of the spring M. It will, therefore, be seen that a variation of pressure in the main pipe does not affect the temperature of the heater, which is entirely controlled by the position of the handle J. As the steam in the heater is never at more than atmospheric pressure, the highest possible temperature

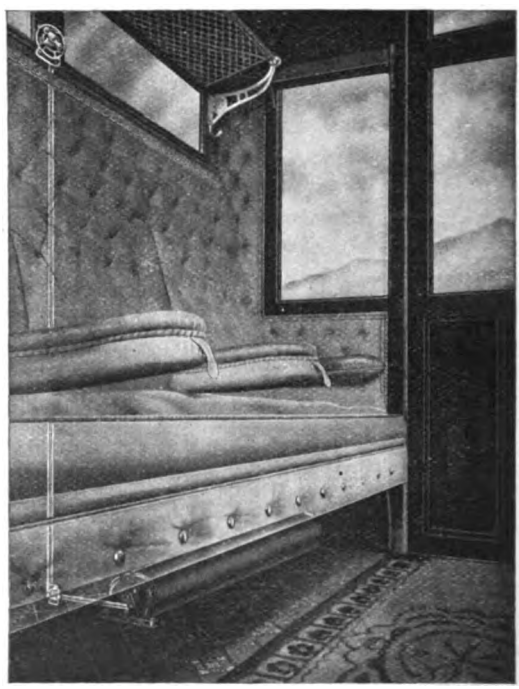

FIG. 4.

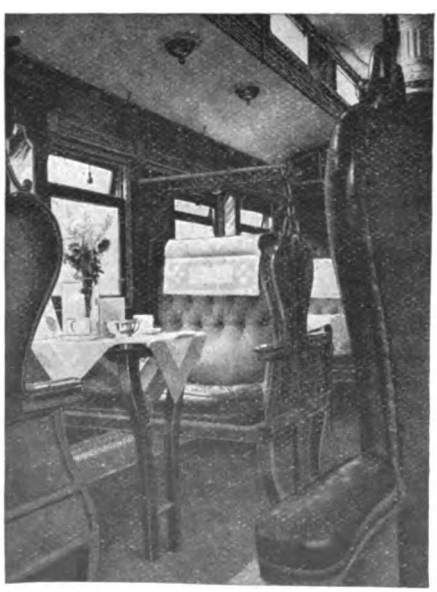

FIG. 6.

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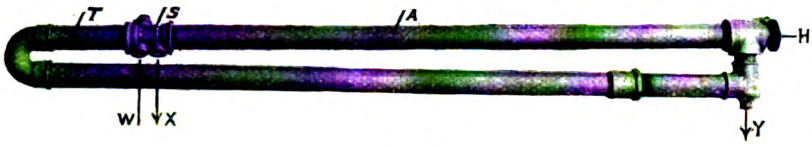

FIG. 5.

FIG. 7.

therein is 212° Fah. The photograph reproduced as Fig. 4 shows a compartment fitted with this type of heater.

For heating dining saloons, corridors, etc., a heater, as in Fig. 5, is placed along the side of the carriage, as shown in Fig. 6. In this case the tube A has a special form of cap, into the opposite end of which a pipe T of the same diameter as tube A is screwed. Steam from the main pipe enters the circuit at W. The cap is so constructed that, when steam arrives, it cannot pass directly into the tube A, but passes into the pipe T, and has to complete the circuit of that pipe before it enters tube A. It then fills tube A and causes the thermostatic tube to expand and close the valve, but only after the whole circuit has reached the desired temperature. A strainer is contained in the cap. Water of condensation escapes to the atmosphere by suitable outlets. The temperature is regulated in exactly the same way as in the heaters already described, by turning the handle H on the end of the heater.

Fig. 7 represents a radiator which is also used for heating saloon carriages, where the necessary

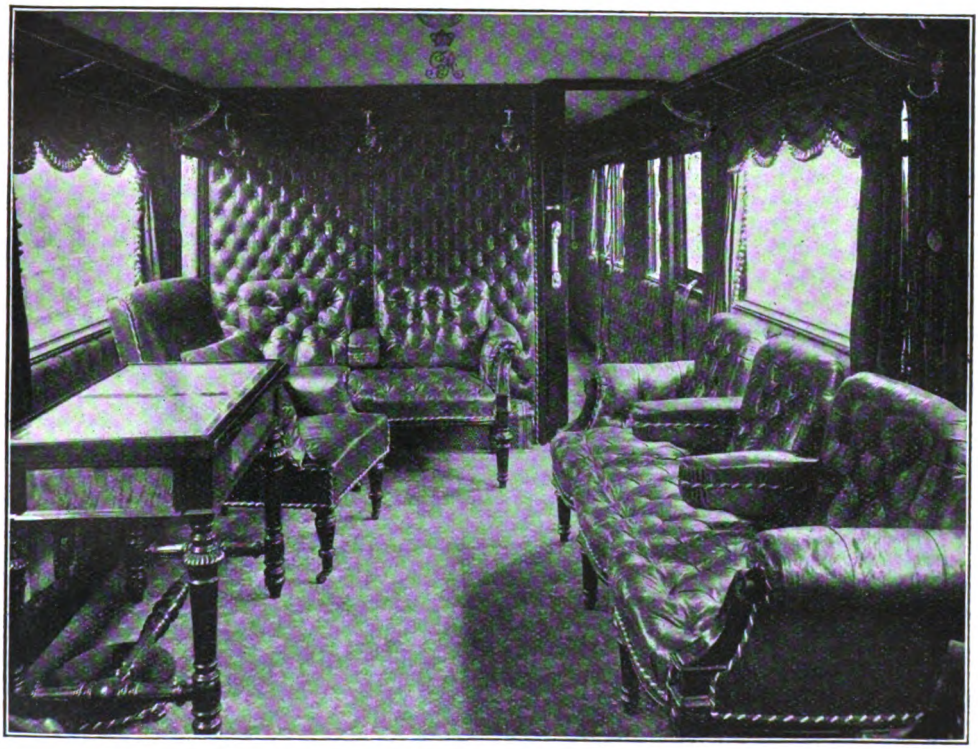

FIG. 8.

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space is not available, or is unsuitable for ordinary heaters—for example, in compartments of sleeping saloons. This radiator is connected to the main pipe by a single branch pipe, similarly to the ordinary heaters, the steam entering the radiator at A. As the radiator is in direct communication with the atmosphere through B, the outlet for the water of condensation, the steam contained in it never exceeds atmospheric pressure. The temperature is controlled by the handle on the end column, in a manner similar to that of the heaters already described. Each radiator is built up of the number of sections necessary to provide the amount of heating surface required.

The efficiency and reliability of the Westinghouse system of steam heating is amply testified to by the fact that a royal saloon used for journeys of His Majesty King George V., shown in Fig. 8, is equipped with this system.

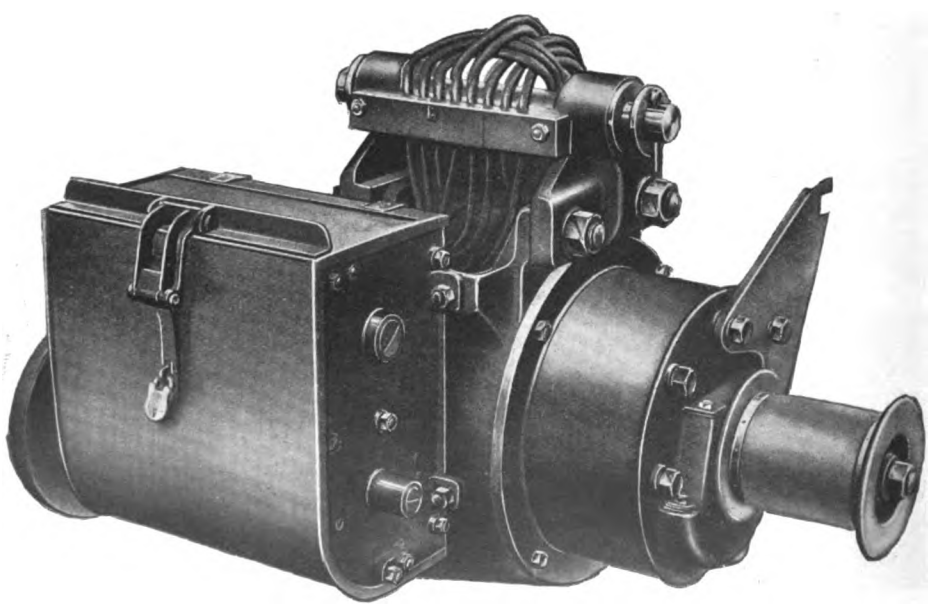
Electric Train Lighting.

It is acknowledged that electric train lighting as ordinarily practiced involves a very appreciable strain upon the engine when the dynamos are axle-driven, the coal consumption attributable thereto is by no means an insignificant factor, and according to usual methods the strain upon the batteries becomes in the aggregate a very considerable item.

In order to obviate or reduce these drawbacks, Pintsch's Electric Manufacturing Company, Ltd., of Friar's House, New Broad Street, London, E.C., have introduced a system of electric lighting which, while realising simplicity, certainty in operation, elimination of complicated and delicate switches, mechanism and regulators, is particularly easy on the batteries and also electrically efficient. The application of this system may be succinctly expressed as "constant voltage instead of constant current." In other words, one of the principal factors which causes battery deterioration is avoided, and instead of being subjected to continual over-charging and under-charging, the batteries are treated in a manner which ensures maximum length of life.

The generator is designed to produce constant voltage, so that the charging current flowing through a battery under a pressure not exceeding 2·5 volts per cell practically disappears on the battery becoming fully charged. If the voltage becomes increased to 2·6 volts the charging current falls to 2 amperes (with a 100-ampere-hour battery). The battery is thus protected from damaging overcharge and the life of the cells is thereby greatly prolonged. Moreover, any loss due to unutilised energy is obviated, for when the battery is fully charged and the lamps are switched off the generator runs practically light, little more energy being required to drive it than that necessary to overcome the friction of the bearings, an important consideration in view of the fact that the haulage of a train having each coach fitted with a generator driven from the axle has a very appreciable influence upon the coal consumption and work of the locomotive.

With the Pintsch system no after adjustment of the apparatus is necessary when once the coach has been placed in traffic, and, the coach is quite independent, as regards its lighting equipment,



A PINTSCH CONSTANT-VOLTAGE TRAIN LIGHTING EQUIPMENT.

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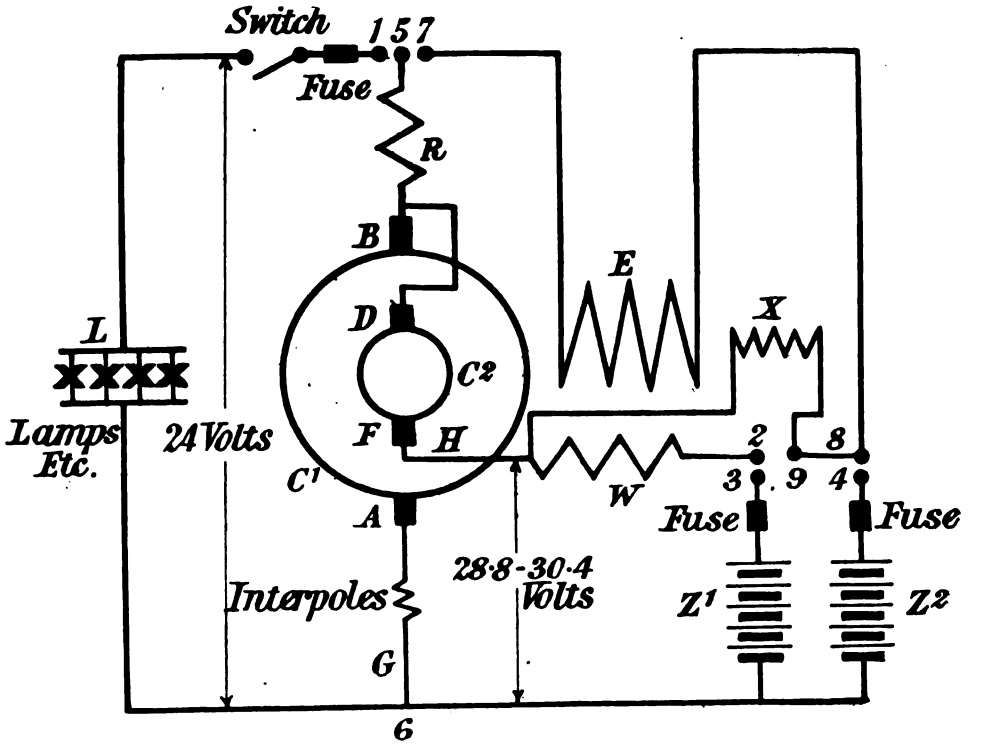

WIRING DIAGRAM : PINTSCH CONSTANT-VOLTAGE TRAIN LIGHTING SYSTEM.

of the class of service on which it is run. For instance, a passenger coach may, after having run on a slow suburban service with its frequent stops, be attached to an express train without the battery becoming overcharged, and inversely a coach originally intended for service on express trains may be attached to a suburban train and still maintain the battery sufficiently charged.

By a very simple method the regulation of the generator becomes such that at no increase of speed can the voltage ever quite reach 24 volts, for if it were to do so, the exciting current would fall to zero and the machine cease to generate any voltage (except that due to residual magnetism). For the same reason it is also impossible for the voltage to drop when the load on the generator is increased, because it is only necessary for the generator voltage to drop by an almost immeasurably small amount to produce the extra excitation necessitated by the increased load. In practice, generators already in service have been run at speeds varying between 600 and 3,000 revolutions per minute, corresponding to train speeds of from 15 to 75 miles per hour, without causing a variation of voltage of more than about ½ volt.

The generator gives the voltage necessary for the lamps, say 24, but it must also be capable of generating a higher voltage in order to charge either half of the battery equipment. For this purpose the armature is provided with two separate windings, each connected to its own commutator, as shown diagrammatically above.

One of the commutators "C1," with brushes "A" and "B," gives a voltage of approximately that of the battery. The other commutator "C2," with the brushes "D" and "F," is connected in series with the first, and adds to it a voltage of about 4·8 volts, giving between the brushes "A" and "D" an approximate voltage of 24 + 4·8 = 28·8 volts, which is sufficient to cause a current to flow through one half of the battery. The lighting current then flows only through the 24-volt winding, the charging current, on the other hand, passes first through the 24-volt winding, and afterwards through the 4·8-volt winding. As the additional winding runs in the same magnetic field as the main winding, it must also generate a constant voltage, and both windings taken together must produce the unchangeable amount of 24 + 4·8 = 28·8 volts. A resistance is inserted whereby the charging voltage is raised automatically according to the number of lamps in circuit, so that a larger consumption of current is compensated for by a correspondingly higher charging voltage. With the lamps switched out, however, this resistance becomes inoperative.

To connect and disconnect the dynamo with the battery and lamps when the train has reached a

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predetermined speed at which the generator is to give the necessary output, a simple switch mechanism is used, actuated by a centrifugal governor of substantial design. Connected to this is a simple reversing switch, so designed that the battery halves are alternated each time the dynamo cuts out.

This system has now been exhaustively tried, upwards of 500 equipments having been in service for some considerable time, and in specific cases "sealed tests" for lengthy periods have been successfully concluded.

Automatic Shut-off Valves for Railway Carriage Gas Reservoirs.

It will be remembered that in the course of the enquiry into the Ais Gill accident, Sir Guy Granet, General Manager, and Mr. D. Bain, Carriage and Wagon Superintendent, Midland Railway, referred in detail to the measures taken by the Midland Company to obviate the fire risks attributed to gas lighting of railway trains. Among other improvements special shut-off valves for the gas reservoirs have been adopted, and in reference thereto Sir Guy Granet stated: "These valves have been supplied in all our new stock, and are being gradually supplied to the old stock; but that has not been done as quickly as I should like, because we had considerable difficulty in finding a valve. At first we found that there was a tendency to deposit carbon in the valve, which prevented its working. Now we have got a satisfactory valve, and it is interesting to be able to state that the company have had an opportunity of testing its efficacy. Last March a train of new empty carriages, the gas cylinders of which were fitted with these valves, was run into by a light engine at Wanstead Park. In the case of two of the carriages, the pressure pipes underneath the carriages were broken, but in each case the safety-valve closed and the gas was unable to escape." The valve referred to is being adopted as a standard feature of Midland practice, as well as by many other railways. It is now supplied by Pintsch's Patent Lighting Co., Ltd., of Friar's House, New Broad Street, London, E.C. It is designed to shut off the gas instantly in the event of a fracture of the high pressure pipe system, and has been specially designed to take the place of the present receiver fittings, and can be easily attached. The fittings are made specially heavy to avoid fracture. The present fittings are not required when these shut-off valves are employed.

Train Lighting Accumulators.

The Alklum Accumulator, supplied by Messrs. Worsnop & Co., Ltd., of Lamp Works, Halifax, is derived from early experiments by a Swedish scientist, Waldemar Jungner, the object being to overcome the weaknesses of lead accumulators when used for traction and portable purposes. The chief qualities at which Jungner aimed for his accumulator were: great mechanical strength; great electric resisting force and durability; small weight; and small volume, the lack of which qualities interfered with the successful operation of the lead accumulator. After years of experiment and trial the principle eventually developed was that of the alkaline accumulator with unchangeable electrolyte. Jungner intended his patent to embrace all combinations of metals or their oxides, which could be referred to the said system, but eventually it was found that a combination between nickel and iron proved the most satisfactory, although the experience of later years has shown that this also had to be somewhat modified.

Although the Alklum Accumulator of earlier days undoubtedly embodied many features that could have proved its superiority over the lead accumulator for many purposes and have justified its placing on the market, it did not yet satisfy its inventor, but as a result of subsequent developments it now takes its place as a thoroughly reliable and efficient storage battery, particularly suitable for installation on trains, moving vehicles, and other purposes where its special virtues commend it. After submitting a number of Alklum Accumulators to very severe tests for eighteen months, one of the European powers has given an order for submarines to be supplied entirely with these accumulators. The Russian State Railways have given a large order for these accumulators for railway lighting, after testing every other well-known accumulator on the market, and they have decided to adopt these accumulators on all their trains. Other countries have also given large orders for railway lighting after very severe tests. In the Alklum accumulator the electrodes consist of inactive retainers loaded with active material which, in the positive plates, consists principally of oxyhydrate of nickel mixed with graphite, and in the negative plates of an alloy of iron and cadmium in a very finely powdered state, this alloy being mixed with certain other substances. The inactive retainers are made from two very thin bands of sheet nickel, finely perforated and prepared by a special process.

The electrodes are immersed in a 20 per cent. solution of pure caustic potash in distilled water. Contrary to what is the case in the lead accumulator, the electrolyte only serves the purpose of a conductor of secondary order between the electrodes, and takes no part in the chemical reactions that must take place in the accumulator. This is a characteristic feature of the alkaline accumulator with insoluble electrodes and unvariable electrolyte. For

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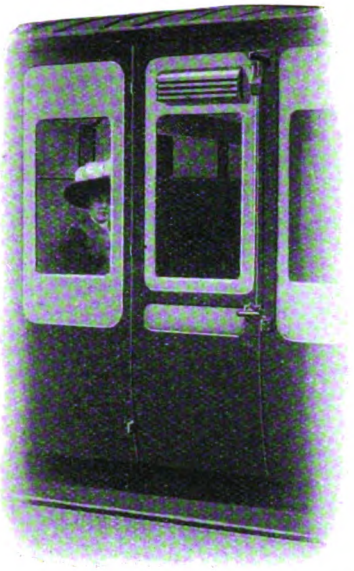
the same reason the quantity of electrolyte may be reduced to a minimum, and this is also made possible by the fact that the distance between the electrodes can be made very small, owing to the special design and great rigidity of the same. Evaporated electrolyte is replaced with pure distilled water to keep the electrolyte in the right condition.

The capacity of the Alklum Accumulator is very little influenced by change of temperature. The electrolyte may freeze at a temperature of below 30° Centigrade, but this does not injure the accumulator. On account of its small weight and volume in proportion to its capacity, as well as its great durability, the Alklum Accumulator has proved specially suited for electromobiles, electric locomotives, electric boats, as well as for many portable purposes, such as lighting of trains, motor cars and yachts, for lanterns of different kinds, ignition batteries for motor cars, for medical purposes, and so on. In all these directions the Alklum Accumulator has met with great success, and has already found extensive use.

The "Security" Latch for Railway Carriage Doors.

ALTHOUGH several special latches for railway carriage doors are in extensive use, particularly those of the safety-catch type, there is an undoubted field for door fastenings which will go even further and render it almost impossible for a door to be opened inadvertently, either by child or adult. To satisfy requirements, a special fastening, in addition to providing the desired security against all possible causes of unintentional door opening, must wear and work efficiently and reliably without fear of getting out of order; must not be cumbersome, bulky or unsightly; must be easily opened from either inside or outside the carriage; and, above all, must not have the appearance of being fastened when not properly secured.

A THOUGHTLESS CHILD MAY OPEN THE DOOR FROM WITHIN, WHILST THE TRAIN IS TRAVELLING, WITH THE PRESENT ORDINARY LATCH.



THE "SECURITY" LATCH AS SEEN FROM OUTSIDE THE CARRIAGE.

The "Security" latch claims to comply with all these essential requirements; it is simple in construction and easily and inexpensively fitted to any door. It has been designed and patented by Mr. Richard Greenhalgh, of Vulcan Works, Shaw Road, Oldham, and of Woodleigh, Alderley Edge. The inventor has erected in the grounds of his residence a replica of an ordinary railway coach, the door being fitted with "Security" latch-locks. This installation has been inspected and tested by many people, including experts from several railway companies. The lock has also been exhibited and explained to officials of the Board of Trade. In every case the substantial value of the invention has been recognised, and it is generally acknowledged that it accomplishes what it claims to be able to do. An official of the Board of Trade who examined a model gave it as his opinion that the device is simple, effective, and durable.

As far as the external appearance of the carriage door is concerned, there is little to distinguish the "Security" fastener from the ordinary appliance. The whole of the apparatus which differs from the usual arrangement is internal, and either may be let into the frame of the door in a morticed socket

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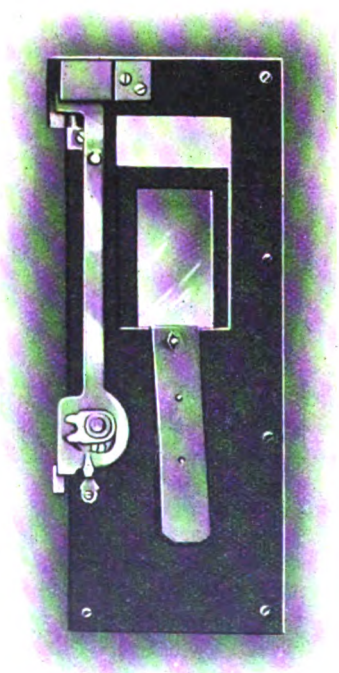
OPENING, FROM THE INSIDE, A DOOR FITTED WITH THE "SECURITY" LATCH.

or may be affixed on the inside of the frame and enclosed in a light wooden or metal casing. It occupies very little space, and, indeed, would not be noticeable if socketed into the frame. There are no springs or cams in the mechanism, and the whole of the active operation of the mechanism is brought about by gravity. A bar of steel, with case-hardened parts wherever contact takes place, is fixed vertically upon the inside face of the door; and at the bottom this bar is shaped in a cog-like form of two teeth which engage similar cogs carried by the spindle operated by the external handle. The turning of the handle raises the bar sufficiently to clear the two ends of the bar from two catches, one at the handle level and the other at the top of the door, and each of which forms a lock for the door when the latter is closed. Both these catches are approached by the corresponding parts of the vertical bar by means of an inclined slide. The door of the carriage cannot be closed without both of these catches coming into operation, so that there can be no mistake as to whether the door is fast or not fast, and both are double acting; that is, the door is securely fastened by the first action when not quite closed and again by the second ratchet action when completely closed. With this lock, if the door is closed, the lock must be in operation, and if it is not closed, of course, it is perfectly plain to anyone inside or outside of the carriage that the door is ajar. The action of the "Security" latch-lock is double, for even if the door be only lightly pushed to the first catch secures it, whilst a complete closing of the door makes a contact with the secondary locking motion.

The closing of the door carries the catch part of the vertical bar along an upward inclined plane of case-hardened steel projecting from the outside of the carriage at the top, and this raises the bar; and on passing the end of the rising incline the bar, which weighs about 4 lbs., falls automatically and by gravitation, and the locking motion is thereby completed.

No handle is provided on the inside of the door at the level of the handle on the outside, but the door may be very simply and easily opened from the inside by either of two ways, both of which prevent the door being accidentally opened. One way is to lower the window and open the lock by means of the outside handle. The other is that at the top of the casing of the vertical bar, which extends to the top of the door, a finger-plate is attached to the bar, by means of which an adult may with ease lift the latch and open the door; but the fact that this access is at the top of the door and out of the reach of children precludes the risk of the door being accidentally opened or, indeed, opened otherwise than of deliberate intention.



THE WORKING PARTS OF THE "SECURITY" LATCH.

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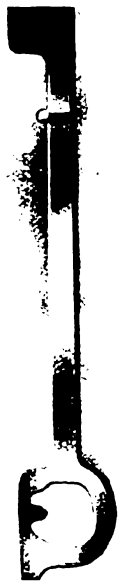


THE VERTICAL DROP-BAR OF THE "SECURITY" LATCH.

It is obvious that it is impossible to make provision against the risk of persons deliberately opening railway carriage doors on a journey, and neither this invention nor any other can claim to do that; but this certainly reduces to a minimum not hitherto reached—even if it does not absolutely eliminate—the possibility of accident through anyone falling out of a door which is apparently but not actually fastened.

Electrical Industrial Trucks for Railways.

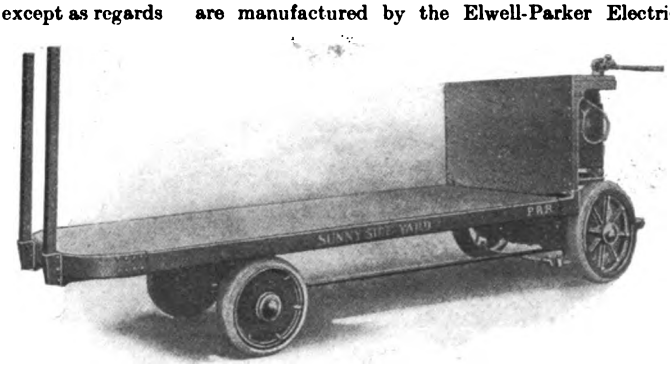
THERE is a growing tendency to introduce power-propelled trolleys and trucks for conveying luggage and goods about the platforms of railway stations, in goods warehouses, railway workshops and in and about factories in place of manual transport, which has hitherto monopolised the field except as regards requirements on a large scale. The difficulty has been to devise an equipment which satisfies the conditions which have to be met, but it has been solved by the introduction of the "Buckwalter" Electric Truck.

These vehicles are operated electrically and constructed of two classes, the baggage group, which includes the straight frame ordinary baggage truck, and the drop frame baggage truck for station platform and dock service; and the freight group, which includes warehouse and freight car trucks, for use in warehouses, machine shops, foundries, mills, etc. Although each individual truck has been designed with some particular service in view and, consequently, has certain features of its own, many of the details, both mechanical and electrical, remain the same for all trucks, thereby simplifying renewals where more than one type of truck is in use. These trucks have a carrying capacity up to two tons.

The distinguishing feature of the "Buckwalter" truck is the use of four-wheel steering gear and double-end control. The driver stands upright on either of the small operating platforms, one of which is pivoted on each end of the truck and operates the steering lever with his right hand and the controller handle with his left. A brake pedal is brought to the operating position when the driver's platform is lowered. The use of double-end control permits of operating on narrow platforms and runways without turning, thus relieving congestion and minimising the possibility of accidents. The operator inserts the steering handle and controller handle in their respective sockets on the end of the truck which happens to be pointed toward his destination.

It has been found in practice that by permitting the operator to ride, the speed of the trucks can be five to six miles per hour as compared with one and one-half to two miles per hour with the old type hand trucks. The operator is relieved of the arduous labour of pulling the truck, and by thus conserving his energy becomes more efficient in transferring the load to its destination. The control in operating the truck is very positive. The driver stands squarely on both feet, and the controlling apparatus is so designed that he naturally assumes an erect position.

An illustration is given of a warehouse truck as recently supplied to the Great Western Railway for use at Swindon Works. "Buckwalter" trucks are manufactured by the Elwell-Parker Electric



"BUCKWALTER" ELECTRIC TRUCK.

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Company, of Cleveland, Ohio, the Railway Truck Supply Company (of Great Britain), of 81, Gracechurch Street, London, E.C., being the sole representatives for Great Britain and the Colonies. It is the intention of the Railway Track Supply Company shortly to stock "Buckwalter" trucks in this country. "Buckwalter" trucks are generally equipped with Edison batteries; and the manufacturers of these batteries now guarantee a life of four years. Trucks are also supplied with lead batteries. The makers have just issued a new catalogue, copies of which can be obtained from the agents.

Railway Transfer Designs.

TRANSFER designs in gold leaf and colours are now generally used as a substitute for hand-painting of the coat-of-arms, lettering, numbers and ornamental corner pieces on the panels of carriages and cars. Transfers stand exposure much longer than hand-painting, which, on account of its thickness, has a decided tendency to crack or blister. Detail can be reproduced in transfers in a way that the most skilled painter could not afford to attempt; and where a large number of the same design is required the cost is fractional. An elaborate design can be kept in stock, and may be transferred complete in a few moments, while to hand-paint it might take weeks.

An example of a transfer design supplied by Messrs. Tearne & Sons, of All Saints' Road, Birmingham, for the London and North Western Railway, is illustrated. This firm claim to be the original inventors, over half-a-century ago, of the process as applied to railway rolling stock. Best quality materials are necessarily used, and Messrs. Tearne & Sons employ only the very finest carat quality of gold leaf, English beaten, and the most permanent colours made. This is, of course, necessary, not only because their transfers have to stand all weather conditions which occur here, but also because they are in regular use on railways of such varied climates as India, South Africa, Australia, Malay States, North America, South America, China, France, Germany, and Russia. Reference to the illustration will indicate the elaborate and highly artistic character of the work involved, though the effect of the colours is necessarily lost in half-tone reproduction. Having a large and competent staff of heraldic artists and the newest and finest machinery and labour-saving devices, Messrs. Tearne & Sons are able to deal most effectively with this class of work. The process of application may be of interest: a coat of varnish is applied to the face of the transfer, and is allowed to get tacky; when at the highest tack, it is placed on to the coach and rubbed down until it completely adheres; a wet sponge is then applied, and the paper comes away leaving the design in a finished state on the panel. Two or three coats of varnish give the coach its final state of brightness.

AN ARTISTIC TRANSFER DESIGN SUPPLIED BY MESSRS. TEARNE AND SONS TO THE LONDON AND NORTH WESTERN RAILWAY.

Schmidt Superheater Developments.

As a means of avoiding the use of damper mechanism, and at the same time combining in one appliance the by-pass and cylinder relief valves, the Schmidt Superheating Company are introducing an automatic by-pass valve which serves these purposes in conjunction with a steam circulating system. It has been found that to protect the superheater elements while steam is shut off, it is sufficient to provide for the circulation of a small volume of steam, and by passing this through the cylinders, in conjunction with the by-pass arrangement, the cylinders are kept warm, the superheater is maintained in condition for superheating, and superheated steam can be obtained almost at starting.

This automatic valve is based upon the action of a differential piston. When the engine is running with the regulator open steam is admitted from the main steam pipe to the upper surface of the piston 1, thereby closing the by-pass valve 2 which controls the passage from one end of the cylinder to the other, and also the valve 3 which controls the escape pipe to atmosphere. A small steam pipe is led from the boiler

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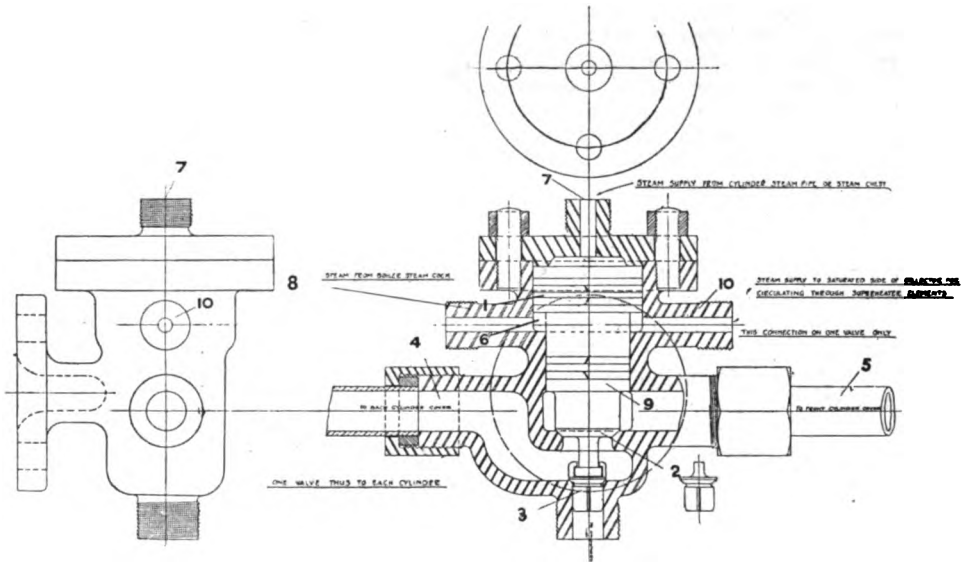

NEW AUTOMATIC BY-PASS AND CYLINDER RELIEF VALVE: SCHMIDT'S SUPERHEATING (1910) CO., LTD.

to one side of the valve casing and steam supplied in this way has continuous access to the space 6 under the larger portion of piston 1. From space 6 the steam passes away on the other side of the casing and is led to a saturated steam chamber in the superheater header. When running, the steam above piston 1 forces it down, as already mentioned, while the auxiliary supply passes through space 6 away to the header and mixes with the steam therein. When, however, the regulator is closed the pressure in 6 is sufficient to raise piston 1, thereby opening valve 2 to connect the two ends of the cylinder, and at the same time valve 3 opens to atmosphere. It follows, therefore, that steam is able to pass from the boiler, through space 6, thence to the superheater header, through the superheater and so to the cylinders, the two ends of which are connected, finally escaping *vid* valve 3.

The volume of steam thus utilised is small, but as there is a continuous flow, it is found quite sufficient to protect the superheater. It also keeps the cylinders warm and in other ways enables superheat to be quickly raised. Any excess of pressure in the cylinders—due to priming or other cause—is relieved by such excess pressure acting upon valve 2 or the annular area below piston 9. Valve 3 is loosely connected to the stem of piston 1 so that it may readily seat itself independently of valve 2. The space above piston 1 is connected by pipes to the steam pipes of the respective cylinders. The auxiliary steam is led by pipes from a stop valve, which is open continuously from the time steam is raised until the engine is put away. To ensure that it is opened, the blower valve is associated therewith so that the blower cannot be used until the steam valve is opened.

Timekeeping.

PUNCTUALITY is the politeness of kings, but to railway officers and men it is something more; it is an absolute necessity. Without accurate timekeeping railway business quickly becomes chaotic. In order to ensure smooth and orderly working the operative railway officer must be continually consulting his watch, which in turn must be absolutely true and reliable beyond all question.

A non-railwayman in search of a new timekeeper and desiring to possess all that is best in a watch cannot do better than follow the railwayman's lead in selecting the firm with whom to do business. Careful enquiry has shown that the firm most high in reputation in the railway world for the supply of low-priced, but at the same time thoroughly trustworthy English watches is Messrs. Owen & Robinson, Ltd., Leeds. This is not a business of recent mushroom growth. It was founded as long ago as 1839.

Mr. William Owen, the head of the firm, has succeeded in spite of foreign competition in obtaining and maintaining a hold on the market for English watches that not a few may envy, but none can excel. To do so has required more than ordinary skill, courage and genius in organisation. The result is the firm can supply far better value for money than can be obtained in the purchase of watches from foreign factories.

Here space is limited, but all interested readers may obtain full particulars by applying

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direct to Messrs. Owen & Robinson, Ltd., Leeds. In addition to prices and information concerning watches for railway work and every day life, particulars will be given of a non-magnetic watch for electrical works, likewise of challenge cups, bracelets and rings and all that appertains to the business of a firm of English watch makers, diamond experts and silversmiths.

Technical Publications.

FOR young men who intend adopting mechanical engineering as a profession there can be no more profitable study than that of the tools he may be called upon to direct and control, or it may be improve and develop.

The mechanical engineer already engaged in railway or other work must keep himself acquainted with the details of construction and the working of each new type of machine.

To meet the requirements of engineers of all kinds the Gresham Publishing Company, 34 & 35, Southampton Street, Strand, London, have produced a new book on novel lines which appeals strongly to all engaged in work with machinery or interested in it, and the firm will forward to any reader of the RAILWAY MAGAZINE an illustrated prospectus giving full details of the work, which is entitled "Machine Tools."

The same enterprising firm have just published a new edition of the standard work, "Modern Electric Practice." This book prepared under the skilled editorship of Professor Magnus Maclean, M.A., D.Sc., presents to the reader the cream of the experience of the whole profession of Electrical Engineering. Bearing in mind the rapid strides now being made in the electrification of railways in various parts of the world, a knowledge of electrical matters is daily becoming of importance to technical and non-technical railway officers and staff.

The Gresham Publishing Company will on application by post to the address above given forward a free illustrated booklet relating to the subject. The firm have likewise for free distribution an illustrated 18-page pamphlet on "Modern Business Practice." This is a useful book for those already in business, but simply invaluable to a man engaged in routine work, and desiring to improve his position.

The "Robinson" Superheater.

THE Locomotive Superheater Corporation, Ltd. have recently received repeat orders for "Robinson" superheater equipments from the South Eastern and Chatham, San Paulo, Bengal Nagpur and Manila Railways; and also orders from the Great Western of Brazil and the Gold Coast Railways. Various Great Central Railway locomotives are being equipped by Mr. J. G. Robinson with his pattern of superheater, including not only the new 4–4–0 locomotives described elsewhere in this number of the RAILWAY MAGAZINE, and engines of other new and standard classes, but also many of the older series. One of Mr. Pollitt's 4–4–0 engines thus treated has also a Galloway-Hill furnace. Some of the engines now fitted with superheaters retain their slide valves, these not being replaced by piston valves as is usually done.

Railway Carriage Equipment.

MESSRS. G. D. PETERS & CO., LTD., of Moorgate Works, Moorfields, London, E.C., and Gotha Works, Slough, occupy a deservingly leading position in respect of their railway carriage specialities. Their "frameless" balanced windows are in extensive use. These consist of a plain sheet of plate glass with no framing, and have the following advantages: maximum amount of light penetrates to the interior of compartment or saloon; window remains balanced in any position; no straps; small effort required to operate window. The balancing device is made in such a way that a spring contained in the spring box, fixed to the floor of the car, acts through a "lazy-tongs" and counterbalances the weight of the window-glass in any position. Rubber stops prevent the window being lowered too far. The introduction of these windows has led Messrs. Peters to devise a fence plate whereby a weathertight joint along the edge of the window is made. Blinds are usually of spring type and Messrs. G. D. Peters & Co., Ltd., make a strong point of designs more convenient than the ordinary simple arrangements consisting only of a spring roller with notches or equivalent devices for holding the bottom bar in one of several positions. They also supply in many cases a combination metallic cover for the spring roller, as it keeps the material clean and free from dust when the blind is up, and gives finish to the blind. Their patent adjustable blind enables the spring to be wound without taking down the blind or the panelling. The "Moorgate Pinch-handle" blind is an interesting design which has realised considerable favour. For upwards of half-a-century Messrs. Peters have taken a leading place in respect of seats of various types, including dining car, ordinary reversible and other designs, as well as spring cushions, covers and other details. Parcel racks and carriage furniture, lavatory fittings, carriage laces and linings, corridor and platform doors, heating apparatus, lighting details, ventilators and other items may also be mentioned while for the supply of Lincrusta-Walton Messrs. Peters are the sole agents.

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Shannon Files.

SYSTEM is the keynote of modern office organisation, and in carrying it into practice an efficient means of filing and recording documents is a *sine quâ non*. It is not sufficient to provide means for storing letters and papers; such means must be so designed that documents can be preserved by hundreds and thousands in such a way that any one can be quickly referred to and detached if required, new papers, or old ones which have been had out for use, being as easily placed in their proper sections. These requirements have also to be met without calling for a high grade of intelligence on the part of the record clerk; and yet the system must be applicable to the large-scale conditions of railway district and head offices, to the various requirements of large firms, and also serve the needs of the small man of business or the branch office where it is realised that efficient record and filing systems pay for themselves in the long run. Shannon Files are used all over the world, and have shown their value in offices of all kinds. The elaborate records required to meet the requirements of the Railway Companies Accounts and Statistics Act can be satisfactorily dealt with by the aid of Shannon files. These appliances, together with other specialities of Messrs. Shannon, Limited, whose offices and showrooms are in Ropemaker Street, London, E.C. (close to Moorgate Street station), are also well adapted for records of stores, railway wagon movements, tarpaulins and the hundred and one other items which come under the purview of railway offices of all kinds. Messrs. Shannon, Limited, will be pleased to send particulars of their methods and specialities, for railway or general use.

Woodworking Machinery.

WITH the world's supply of timber rapidly diminishing and whole forests being consumed to provide paper for the daily press, a firm not only constructing wood-sawing and planing machinery but also making its own patent machinery for the utilisation of waste timber, is worthy of more than passing notice.

Waste material arises in all industries in which wood is employed, such as shipyards, collieries, and railway wagon works. To turn such waste wood, irrespective of size and shape, into marketable firewood has been the aim of Messrs. M. Glover & Co., Leeds, and right well have they succeeded. Their machine is fitted with a conveyor into which the waste timber is packed. The conveyor carries the material under a guillotine rapidly reciprocating. The peculiarity of this guillotine is that there are two blades fixed at right angles to each other, which cut the blocks at one stroke. Rate of speed, and size of sticks, can be varied at will. The cut sticks are then taken away automatically over sifting rollers, by means of which dust and chips are got rid of, and the sticks fall into baskets if desired, or they are conveyed automatically to stick-arranging and bundling machine, from which they issue in bundles.

There still remain the sawdust and chippings, and these are combined with certain cheap chemicals and fed into a firelighter briquette-making machine, which rapidly turns out finished briquettes.

The firm is further famed for its "Ideal" saw-guards, which, with the safety circular cutter block for planing machines, has been taken into use by most of the British railways and by many railway engineers overseas.

Time Recorders.

TIME recorders are largely used in railway workshops for recording the time of men booking on and off duty, thus saving pay for time taken by workmen in walking from the entrance gate to their work. Such appliances provide an efficient method of obtaining accurate data as to the time cost of production. Every man records the time spent upon each job, instead of merely his hours of work and also fills up time cards or sheets supplying details of what he has done. The data is more reliable than that provided by older methods. Recorders do not necessitate alterations in bookkeeping. Among the time recorders in use the most satisfactory are those manufactured by the National Time Recorder Co., of 5, Blackfriars Road, London, S.E., which have been extensively adopted in recent years. These machines of British manufacture, are extremely simple in construction, and strongly built of gun-metal and steel, with a specially made clock movement insuring continued accuracy. The patent check action is most valuable. This device avoids mistakes in registering the time for other than the correct one. Their initial cost is not heavy, and is more than justified by results. The apparatus is placed in the most central position of the department, so that no time may be lost by workmen in reaching it for the purpose of registering, and it should, where possible, be within sight of the foreman or his clerk. Upon entering the workman records the time of arrival on his pay card, taking the card bearing his number and name from the OUT rack, placing it in the card receiver of the recorder, printing the time, and placing it in the IN rack. He then goes to his number in either the rack marked Work "ahead," Work "in operation," or "Suspended Work," takes his job card, registers the time of starting, and places it in the same number in the Work "in operation" rack, showing he has a job in hand. When the job is finished, he stamps the time, and places the card in a box for the purpose. Cards are collected periodically, and taken to the costing department. The selection

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of headings and the equipment of card racks varies according to requirements. Different coloured cards may be used for respective departments or classes of work.

Rail Drilling Machine.

ONE of the tendencies of modern industry is to introduce tools and appliances for all kinds of detail and incidental purposes; and it is found that even the standard hand tools and the like can often be advantageously displaced by devices adapted to meet specific requirements. The device illustrated herewith, a rail drilling machine now being supplied by Messrs. W. Silversteen & Co., of 147, Cannon Street, London, E.C., is of this class. This is a handy appliance for drilling rails

RAIL DRILLING MACHINE:
MESSRS. W. SILVERSTEEN AND CO.

while in position. It can also be used without interfering with traffic, the machine being turned down as shown to allow trains to pass. Among other tools of a corresponding character supplied by Messrs. Silversteen & Co. may be mentioned a device for screwing coach screws in and out of sleepers, dog spike removers, rail benders, track and curve gauges, rail cutting machines, rail lifters, carriers and planers, jack screws, rail adjusters, and other appliances suitable for permanent way operations.

All-Steel Coaches.

To meet further traffic requirements on the Metropolitan District Railway, thirty new all-steel coaches are being constructed, and for these superior charcoal finish panel plates, supplied by Messrs. John Lysaght, Ltd., of Orb Works, Newport (Mon.). These well-known plates were also used for a large number of all-steel coaches already in service on the Metropolitan District Railway, and built by various makers. Various other railway companies at home and abroad are using, or intend using, all-steel vehicles in which Messrs. Lysaght's panel plates are, or will be, included.

Smokestack Black.

THE fact that locomotive chimneys have to withstand the effects of heat within and climatic conditions without has rendered the production of a suitable painting material no easy problem; but Messrs. Naylor Brothers (London) Limited, have satisfactorily solved the problem. Their "Smokestack Black" is used very widely on British and foreign railways. Besides resisting exposure to weather without having to be varnished it is not liable to peel off under the effects of heat. It well maintains its brilliancy and gloss and can be easily cleaned and polished with oil without affecting the black.

Automatic Railway Carriage Door Locks.

DURING the current year, Messrs. Joseph Kaye & Sons, Ltd., of Leeds, have supplied and have in hand no fewer than 6,220 of their patent automatic railway carriage door wedge locks, together with the requisite number of patent safety catches, and the inside and outside handles for the same, to the North Eastern, Midland, Great Central, South Eastern and Chatham, Great Eastern, Cheshire Lines, Lancashire and Yorkshire, Great Northern, Central London, South African, and Bhavnagar India State Railways.

Fountain Pens.

THE fountain pen is now an indispensable adjunct in business and private life, but the "Swan" pen, supplied by Messrs. Mabie, Todd & Co., 79 and 80, High Holborn, London, W.C., still maintains its leading position as one of the most reliable and satisfactory pens on the market. The standard design is sold at 10s. 6d., with numerous special designs suitable for presentation. As a Christmas gift a "Swan" pen combines permanent usefulness and appropriateness.

Railway Models.

THE scale model of a section of the line between Birkett Tunnel and the Mallerstang starting signal, which played such an important part in the trial of Rex *v.* Caudle in connection with the Ais Gill disaster, was built by Messrs. Bassett-Lowke, Ltd., Northampton. The model was about 9 ft. in length, and was to the scale of 70 ft. to the inch, but even at this minute scale every important feature of the district was accurately reproduced. This was built to the order of the Public Prosecutor, Whitehall.

"Morse" Rocker-Joint Chains.

To meet the increasing demand in Scotland for their "Morse" patent rooker-joint silent chains for high-speed power transmission, the Westinghouse Brake Company, Ltd., of 62, York Road, King's Cross, London, N., have secured the services of Mr. D. McGregor Stewart, of 166, Buchanan Street, Glasgow, to act as their agent, and to give the personal attention to details necessitated by the requirements of their ever-growing *clientele* in Scotland.

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PERTINENT PARAGRAPHS

Winter Continental Facilities.

IMPORTANT developments in the Continental train services and facilities have been arranged by the South Eastern and Chatham Railway and the Northern, Paris, Lyons and Mediterranean, and other Continental railways. Improvements and accelerations will come into force on December 1, chiefly affecting the 4.30 p.m. Continental Express from Charing Cross *viâ* Dover and Calais introduced this summer. It will be due in Paris at 11 p.m., or in the remarkable time of 6½ hours from London. From December 9 this train will have a connection to Bale *viâ* Laon, and from December 15 a connection to Interlaken *viâ* Délemont. Sleeping Cars will be run from Calias to Bale and Calais to Interlaken, and passengers for the Winter Sports will find this the quickest service to the Engadine and the Bernese Oberland. Of the many routes to Milan, that through the Lötchberg Tunnel is now the quickest, as it is possible to leave London by the 2.5 p.m. Folkestone Boat Train, and reach the capital of Lombardy in 23 hours. A through carriage from Boulogne to Milan has been arranged by this new route. The Riviera travelling facilities include a through carriage with Lits-salon from Calais to Ventimiglia in connection with the 11 a.m. service from Victoria, and a Sleeping Car from Calais to Paris (Lyon) in connection with the Côte d'Azur Rapide. Passengers for this Service leave Charing Cross at 9 p.m. Additional trains to the South of France will run as the season advances, and a Special Excursion Service for Cannes, Nice, etc., is announced to leave Charing Cross for the Christmas holidays.

* * *

The West Coast Route to Scotland.

ALTHOUGH necessarily amplified during the summer months a notable feature of the Anglo Scottish train services is the extent to which they are supported during the winter. There is, indeed, a continuous stream of travel all the year round between London, Bristol, Cardiff, Birmingham, Liverpool, Manchester, Leeds and other industrial and commercial centres in England and the principal Scottish cities: and at all times the West Coast Joint services provided by the London and North Western and Caledonian Railways, assisted by their associations with the Lancashire and Yorkshire, Great Western and other lines are supplied on a singularly complete and comprehensive basis. All the day services are made up of the best modern stock belonging to the respective railways or jointly provided, supplying comfortable accommodation, with steam heating, good lighting (electric in many cases), and on all the day services restaurant car facilities throughout, with sleeping cars on the night trains. The times of departure and arrival are arranged at convenient hours, the respective trains starting usually in the morning, after midday or in the early or late evening, thus meeting the all-round requirements of business men. A number of through carriages are provided to amplify the direct services, and a remarkable standard of punctuality is realised even in the severest weather. The journeys involved are, indeed as comfortably and conveniently made in winter as in summer. For the Christmas and New Year holidays the standard arrangements are amplified on a generous basis, and with cheap fares and convenient travel arrangements the busy traffic of these periods is very efficiently dealt with.

* * *

The Railways Royal Commission.

IT has been assumed in some quarters that the appointment of a Royal Commission to consider the relations between the railways and the community is simply a preliminary step towards the nationalisation of the whole of the lines in the United Kingdom. We doubt, however, whether there is any ground for such a conclusion. The case for the acquisition by the State of the railways of this country has yet to be established, and it will have to be a very strong case indeed before the House of Commons—whatever be the political complexion of its majority—is likely to assent to the enormous public expenditure which the transfer and purchase would involve. It is misleading to draw comparisons with either continental or colonial systems, and when advantages and disadvantages are taken frankly into consideration, we have still to be convinced that State control would be of any real or lasting benefit to travellers, to traders, or to railway employès. Mr. Buxton states that his experience at the Board of Trade has "Continually and continuously confirmed the view that all is not well between the railways and the traders and the community." He adds that the "great extension of amalgamations and working agreements has altered the whole position as regards competition and monopoly, and the position of the railways in reference to the State." But it is somewhat singular that the growing discontent which the right hon. gentleman suggests has not yet been disclosed through the ordinary channels of public information, while as to amalgamations and working agreements, these were strongly recommended by the Departmental Committee which reported to both Houses of Parliament only two years ago. No representative of the great interests concerned has been included in the Royal Commission, which has already begun its labours in public: but there is every reason to believe that it will make a thorough and an

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impartial inquiry into the whole subject covered by very wide terms of reference; and we are inclined to think it will show conclusively that the nationalisation of our railways would be an expensive and a disappointing experiment.

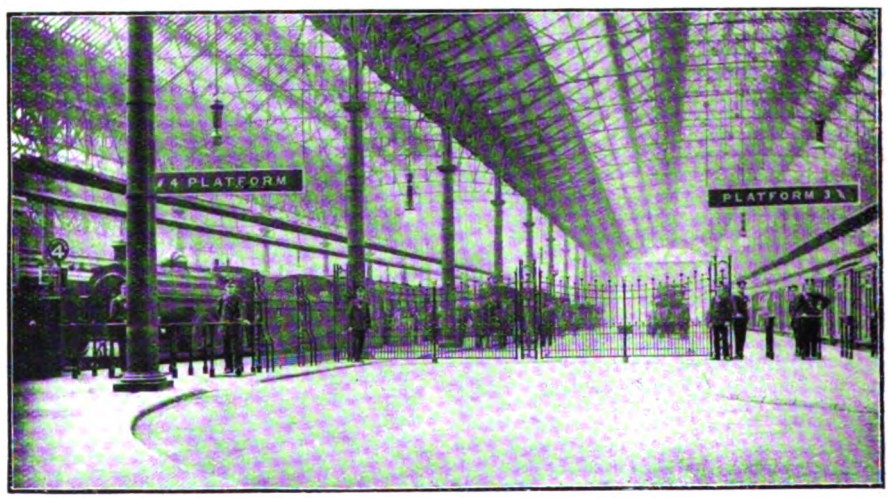
* * *

Train as Rest Cure.

UNDER this heading a daily contemporary recently described the experiences of a lady living in the West End who was at a loss what to do for a change on a recent dreary wet day. There was no pleasure in motoring out of London, so she and a friend went to Euston and spent the day in a restaurant train travelling between London and Birmingham. They had luncheon, tea, and dinner in the train and enjoyed themselves. "It was a wholly delightful way of spending a few hours out of London on a hideous day like this . . . and I felt twice as well since I left London this morning." With the sentiments thus expressed we are in cordial agreement. There is, indeed, much to be said for a railway journey as a relaxation, especially as on all standard routes comfortable and well-equipped trains with up-to-date restaurant car accommodation are the rule on the principal services. On other points, however, some further details would be of interest. The down journey was made presumably by the 11.50 a.m. or the 12.15 p.m. from Euston, both these trains providing the required Luncheon Car facilities. But the trouble is that the 3.40 and 5.0 p.m. trains from New Street convey Tea Cars and the 6.20 p.m. Dining Cars. Presumably on the last-mentioned service tea would be supplied on request; but it is doubtful whether any passenger would include both tea and dinner in the course of a two-hour journey. The question may also be asked—How was the whole day spent in travelling, with so comprehensive a selection of two-hour and fast trains, and was the weather in Birmingham more favourable than the dreariness and rain left behind in London?

Straight Railways.

So few are the railways which are absolutely straight for more than a few miles, if so far, that there is some justification for comment when specific instances can be cited. The principal example in the United Kingdom is that between Paddock Wood and Ashford, on the South Eastern and Chatham Railway, where 22 miles of perfectly straight line are seen. The impression created when one travels over this section on the footplate is peculiar, as the rails stretch away in front of the train for mile after mile without a curve in sight. The St. Petersburg-Moscow line might also be mentioned, though the question could be raised as to whether this is quite as straight as it is supposed to be, notwithstanding the immense cost entailed in its construction. America possesses a few exceptional stretches of direct railway, and now the claim is made that New Zealand provides the longest section of railway without a curve—a distance of 136 miles. It is difficult to accept this statement in view of the geographical character of the country. We shall be glad to hear from readers in other parts of the world as to further examples of long curveless stretches of railway.



LANCASHIRE AND YORKSHIRE RAILWAY.

Closed platforms at Exchange Station (Liverpool). Passengers leaving the station in cabs and other vehicles, are required to show their ordinary or platform tickets before passing through the gateways.

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"Closed" Stations on the Lancashire and Yorkshire Railway.

No fewer than 13 stations on the Lancashire and Yorkshire Railway are now "closed," that is, only ticket holders are allowed upon the platforms. These stations are Manchester (Victoria), Liverpool (Exchange), Preston, Salford, Accrington, Blackburn, Bolton, Formby, Sandhills, Halifax, Rochdale, Waterloo, and Wigan. At five stations, *i.e.*, Manchester, Liverpool, Preston, Waterloo, and Bolton (Trinity Street), automatic issuing machines are in use, enabling the public to obtain penny tickets if they wish to accompany friends who are to arrive or depart by train. This system has been

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AUTOMATIC TICKET ISSUING MACHINE, VICTORIA STATION (MANCHESTER): LANCASHIRE AND YORKSHIRE RAILWAY.

successful beyond all anticipation. The crowds which formerly assembled at the stations watching the trains have now disappeared, and no one would wish to see a return to the old state of affairs, which permitted all sorts of undesirable characters to mingle with *bona fide* passengers. Among those who have been cleared out are the luggage thief and the pickpocket. Railway stations are the happy hunting ground for these people, and although it is not claimed that the charge of one penny will keep them off altogether, the crowds will not be on the platforms for them to operate on, and they will be more easily detected. A person carrying a portmanteau who can only produce a platform ticket will be an object of suspicion, and will, of course, come under the surveillance of the collectors at the barriers. Taking into account the additional labour employed at the barriers, the gain to the railway company from the sale of platform tickets is not material, but the advantages secured in connection with the rapid and punctual despatch and clearance of trains are unmistakable. Consequently, there is every inducement to adopt the platform ticket system wherever the structural arrangement of stations may permit.

East Croydon Signalling School.

A NEW departure so far as the London, Brighton and South Coast Railway is concerned was inaugurated on Monday, November 3rd, when a school for instruction in Railway Outdoor Working and Signalling was formally opened at Croydon. The necessity for such a school had long been recognised by the Superintendent of the Line, Mr. Finlay Scott, and about a year ago he approached the General Manager, Mr. William Forbes, who at once took a keen interest in the scheme and obtained the sanction of the Directors to building and equipping the school, together with the cost of upkeep and a grant for prizes. Work was at once taken in hand by the Engineer, Mr. Morgan, and an excellent room measuring 52 feet by 28 feet has been built adjoining the District Engineer's office at East Croydon.

Equipment comprises a model railway and junction 47 feet long, which includes main and branch lines, refuge siding and a crossover road, fully signalled and furnished with facing point locks and bars, fouling bars, discs, detectors, etc., practically the same as would be done at any similar junction on the Brighton Railway. The whole of the signals and connections are worked from a 24 lever frame, properly interlocked. Two model trains are provided, one a passenger and the other a goods, all vehicles and engines being painted to the London, Brighton and South Coast colours and designs.

To work with this model there is a complete set of Tyer's Train Signalling instruments, which are mostly in use in the southern district of the line, properly connected as between four boxes, known respectively as A, B, C and D. In addition to this a set of Sykes Lock and block train signalling instruments connected as between three boxes, viz., A, B and C, with eight nearly full size levers to work with them. Two switches, one for Tyer's and the other for Sykes, enable the centre box B to be switched out. There are also two single line electric train staff pillars with staffs, electrically connected, likewise a train staff and ticket box for instruction in the working of single lines. Two pairs of single needle telegraph instruments are fixed, two at either end of the room and connected in pairs, for telegraph practice. Other equipment consists of a full size home signal post and arm, with lamp, etc., and a signal repeater working with it; also models of a Clayton's fog signalling machine and placer. A main lock up switch is provided to enable the current to be cut off from all instruments except the telegraph instruments, thus putting them out of action when not required.

The object of the school is to give the railway staff an opportunity of acquiring a knowledge of signalling and outdoor railway working, and to avoid the necessity of men going into signal boxes for that purpose, which hitherto has been the only means available. On Monday nights, from 8 to 9 o'clock, the school is open for lectures, and on Friday nights between the same hours for telegraph practice. Following are some of the subjects which will be dealt with during the session:—

1. Working of fixed signals, facing points, trailing points, catch points, level crossing gates, etc.
2. Double and single line block working.
3. Sykes' lock and block.

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4. Working of single lines by train staff and ticket, and by electric train staff.
5. Equipment of trains (head lights, tail lights, guards' equipment, etc.)
6. Working of Westinghouse brake.
7. Slipping regulations.
8. Emergency working of double lines as single lines.
9. Protection of trains, wrong line working, etc.
10. Working during fogs or snowstorms.
11. Working of lines when signals or locking gear are out of order.
12. Precautions taken by Engineer's department when repairing road, etc.
13. Hand signalling.

Mr. W. E. Reynolds has been appointed lecturer and will conduct the classes on behalf of the Superintendent of the Line. Judging by the enthusiasm displayed, the school is fulfilling a long felt want.

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Central Argentine Railway.

At the recent general meeting of the proprietors, the chairman, Sir Joseph White Todd, Bart., referring to his visit to the property this year, said progress and prosperity were not merely continuing, but daily increasing. Great developments had taken place at Santa Fè, and in Tucuman he found proof of the record sugar crop of this year. Santiago del Estero similarly reflected the awakening that was taking place in the northern province of which it was the capital. Another city of great importance which revealed a wonderful development was Cordoba. Alta Gracia was growing in popularity not only as a health resort, but as a centre of recreation for the workers in Cordoba, with which city it was now in direct railway communication. The quarries at that point were also now in full working. He went over the new branches, which were to open up districts hitherto unserved by railway communication in the province of Cordoba. He was safe in saying that, excellent as were the regions that had furnished them with income in recent years, the new ones were fully as good, if not superior. He also visited the irrigation works which they were constructing on account of the Government. Those were destined to still further and materially aid the province of Cordoba. The Directors were seeking authority to increase the capital, which increase would in time be required for completing some of the works in hand and under consideration, and for supplying the extra rolling stock of all kinds rendered necessary, not only by their growing business, but by their expanding mileage. They had no intention of making any issue at present, but when the issue was made, whatever its nature, it was to their own holders that the offer would, in the first place, be made. Excellent as were the results of their last year's working, since its close, on 30th June last, they had been doing even better. He told them last year that it was satisfactory to be able to point to the fact that in the last ten years, notwithstanding their growth of capital, the ratio of their gross receipts to that capital was greater than it was at the time of their amalgamation. This evidenced, in the most practical manner, the truth of his assertion that their branches opened up excellent land, and the fact was further demonstrated by their revenue per mile of line per week, which showed, because of the new mileage, the remarkable rise from £23 3s. 1902-3 to £41 11s. in 1912-13, or 79½ per cent.

* * *

Christmas on the South Coast.

The days of the stage-coach, of Mr. Pickwick and his friends, and of the much-belauded and probably over-rated "Christmas in the olden time" are gone; and in their place we have the busy railway station, and crowded trains, early and late, on Christmas Eve, loaded with people going away for the holidays. A large proportion are bound for the "old home" and family reunions or festive gatherings of friends and relations; but the percentage whose destination is a modern hotel or up-to-date boarding house where special provision is made for Christmas is steadily growing. Particularly is this the case with favourite South Coast resorts such as Brighton, Eastbourne and Worthing, where Christmas gatherings at hotels and boarding houses attract large numbers of people. In many cases special inclusive terms are arranged to cover the holidays, including the Christmas dinner and the Christmas and Boxing Day parties, frequently with a Christmas Tree for the children. The railway arrangements are very convenient for traffic of this class, including fast trains at all hours, with expresses just after midnight for late workers and those who wish to stay in London for the evening. Cheap tickets will be issued from London on Wednesday, December 24th, available to return on Friday or Sunday, December 26th or 28th.

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A Peculiar Railway Junction.

Mr. Mackay's photographs reproduced on page 421 of the November Railway Magazine have aroused considerable interest, but do not appear to have introduced much difficulty. The junction depicted is between Dinting and Glossop on the Great Central Railway, the points being taken off in advance of the actual divergence for engineering reasons. Glossop is behind the photographer, the left hand branch leads to Dinting station, and the right hand lines to Hadfield. A triangle is completed by the Manchester-Sheffield main line, which is joined by both sections, but in opposite directions. Therefore the left hand line leads to Dinting and Manchester and the right hand section to Hadfield and Sheffield. The first correct reply, from Mr. Harold P. Pentelow, was received on the morning after publication.

* * *

Crampton Locomotives on the Lancaster and Carlisle Railway.

Several readers have written, pointing out that Mr. Rake is in error in referring to a Crampton locomotive as having been employed on the Lancaster and Carlisle Railway, the locomotive illustrated on page 402 of the November Railway Magazine being, in fact, the *Folkstone*, No. 136, South Eastern Railway, built in 1851 by Messrs. Robert Stephenson & Co. Mr. Rake is unable to locate the source of information upon which he based his assumption that a Crampton was used on the Lancaster and Carlisle Railway, and in default of further evidence it must be accepted that the various gentlemen who have written, some of them acknowledged authorities upon early locomotive history, are correct.

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Mr. Harry S. Wainwright, Locomotive, Carriage and Wagon Superintendent, South Eastern and Chatham Railway, has resigned in consequence of ill-health. Mr. Wainwright commenced railway service in 1878, on the Midland, afterwards being engaged for considerable periods on the London, Tilbury and Southend and South Eastern Railways in various responsible positions. During his tenure of office as chief of the mechanical department under the South Eastern and Chatham Managing Committee, great improvements have been made in the locomotives and rolling stock. Since November, 1898, Mr. Wainwright has efficiently filled the position of Honorary Secretary to the Association of Railway Locomotive Engineers of Great Britain and Ireland. Mr. Wainwright is a member of the Institution of Civil Engineers, and holds the rank of Major in the Engineer and Railway Staff Corps, R.E. Territorial Force, and is also a member of the Territorial Forces Association for the County of Kent, and Order of the Royal Prussian Crown (Germany).

* * *

Mr. R. E. L. Maunsell, M.A., M.Inst.M.E., Locomotive, Carriage and Wagon Superintendent of the Great Southern and Western Railway of Ireland, has been appointed to succeed Mr. H. S. Wainwright as Chief Mechanical Engineer of the South Eastern and Chatham Railway. In this connection readers may be referred to the October Railway Magazine and the illustrated article therein describing the Inchicore Works of the Great Southern and Western Railway, with portraits of Mr. Maunsell and his chief assistants, and particulars of locomotives and rolling stock built under his direction. Although it is only 2½ years since Mr. Maunsell took charge at Inchicore he has been responsible for important developments and for several interesting locomotive designs; and we offer our congratulations upon his selection as the new chief at Ashford. Mr. Maunsell began his engineering training at Inchicore, as an apprentice under Mr. Ivatt. After spending several years there, he joined the Lancashire and Yorkshire Railway, serving first in the works and drawing office at Horwich, and later occupying the post of locomotive foreman in charge of the Blackpool and Fleetwood district. In 1894 he went to India, as Assistant Locomotive Superintendent of the East Indian Railway, being subsequently appointed District Locomotive Superintendent of the Asansol district. Two years later he returned to Inchicore as Works Manager under Mr. Robert Coey, until, on the resignation of Mr. Coey, through ill-health, Mr. Maunsell was appointed in June, 1911, to the position which he is now vacating.

* * *

Sir W. Granet, General Manager, Midland Railway, has been elected Chairman for 1914 of the General Managers' Conference of the Railway Clearing House. Mr. Granet was called to the Bar in 1893, and practised for some years on the Northern circuit. He succeeded Sir Henry Oakley as Secretary to the Railway Companies' Association in 1900, which position he held until he entered the service of the Midland Railway, becoming Assistant General Manager in 1905. In July, 1906, on the retirement of Mr. John Mathieson—who died a few weeks later—he was made General Manager. On the occasion of the Coronation of King George V., a knighthood was conferred upon Mr. Granet. Sir Guy Granet took a leading part on behalf of the railway companies, in connection with the negotiations associated with the Railway Strike in August, 1911.

* * *

Mr. W. C. May, Chief Goods Manager, Great Eastern Railway, has been elected by his colleagues to be Chairman of the Goods Managers' Conference of the Railway Clearing House for 1914. Mr. May entered the service of the Great Eastern Railway in the Rates Office of the Goods Department in January, 1886. After serving there in various capacities he was in 1895 appointed to represent the Great Eastern Railway on the London Corn Exchanges. This position he held until 1897, when he took up the duties of Chief Canvasser for the Southern and Western Counties Agricultural Shows. In January, 1898, he was transferred to the Mineral Department as Outdoor and Coal Exchange Representative. This post he filled for two and a half years, till in July, 1900, he was given the important position of Chief Assistant to the Mineral Manager, and in March, 1903, he was promoted to the office of Mineral Manager. Mr. May's present appointment includes the office of Goods and Mineral Manager, and dates from March 31st, 1910.

* * *

Mr. W. Clow, Superintendent of the Line, Great Central Railway, has been elected Chairman of the Superintendents' Conference of the Railway Clearing House for 1914. Mr. Clow succeeded Mr. Haig Brown on July 1st, 1910, on the retirement of the latter gentleman. He entered the service of the Midland Railway in 1878, and remained with that Company for 17 years. In August, 1895, he left the Midland Railway to join the Midland and South Western Junction Railway, where he stayed 7 years. On September 1st, 1902,

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he joined the Great Central Railway as Outdoor Assistant to the General Manager, was promoted to the position of Assistant to the Superintendent of the Line in May, 1903, and appointed Assistant Superintendent of the Line on April 2nd, 1905.

* * *

MR. E. A. NEALE, General Manager, Great Southern and Western Railway, has been unanimously elected Chairman of the Irish Railway Managers' Conference for the year 1914. Mr. Neale started his railway career in the Irish Railway Clearing House, in 1875, from which place he was selected for a position in the Audit Office of the Great Southern and Western Railway about four years later. In that company he held varying positions until 1895, when he was appointed General Manager of the Waterford and Central Ireland Railway. On the amalgamation of that railway with the Great Southern and Western Railway, in 1900, Mr. Neale became Assistant Traffic Manager of the latter railway, and subsequently Goods Manager. He was appointed Traffic Manager in 1903, and in January, 1913, was selected to succeed Mr. C. H. Dent as General Manager.

* * *

MR. A. KAYE BUTTERWORTH, General Manager, North Eastern Railway, recently received a deputation organised by the Railway Committee of the Newcastle and Gateshead Chamber of Commerce, consisting of representatives of traders in the North Eastern district. Complaints were made with regard to delays in the transit of goods, and one speaker stated that at one time two or three days was sufficient to obtain goods from Birmingham, but now 12 and 14 days were frequently occupied. Various members of the deputation gave specific instances of delays, and a representative of Messrs. Bainbridge said the railway company had lost 60 per cent. of the outward traffic owing to the delays. Mr. Butterworth promised early attention to the points detailed.

* * *

Two interesting lantern lectures dealing with "Lakeland" have been prepared by the Furness Railway. The slides can be borrowed by responsible people for lectures, entertainments, etc., with a printed descriptive booklet. The slides are descriptive of the choicest Lakeland scenes, as well as places of interest in connection with the Furness Railway. No. 1 set includes 86 slides, No. 2 set 97, each having its own distinctive letterpress. Applications for the slides should be made to Mr. Alfred Aslett, Secretary and General Manager, Barrow-in-Furness. The purpose for which the slides are required should be stated along with the date, and the number of the set of slides required. To ensure booking the slides, sufficient time should be allowed between the application and date on which required.

* * *

As President of the Great Western Railway (London) Lecture and Debating Society, Mr. Frank Potter, General Manager, inaugurated the new session at a largely attended gathering in the General Meeting Room, Paddington station, on October 15. Viscount Churchill, G.C.V.O. (Chairman of the Company), presided. After congratulating the members of the society upon the commencement of their tenth session, Mr. Potter referred to the unfair criticism of railways which now figures so prominently in the public press, to agricultural traffic, obligations of railway companies, the upward tendency of expenditure, labour unrest and other matters.

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THE first five of a new series of 4–6–0 ("Prince of Wales" class) express passenger engines (Schmidt superheater) will shortly be running. They bear Nos. 362 *Robert Southey*, 892 *Charles Wolfe*, 1081 *John Keats*, 1089 *Sydney Smith*, and 1134 *Victor Hugo*. The following "Precursors" are now running equipped with the Schmidt superheater:—Nos. 515 *Champion*, 564 *Erebus*, and 2011 *Brougham*. Nos. 1550 *Westminster* and 2664 *Queen Mary* (of the "Queen Mary" class) have also been superheated. No. 82 *Charles Dickens* ("George the Fifth" class) is stationed at Longsight, and works daily to London, leaving London Road at 9.45 a.m., and returning from Euston at 4 p.m. The vacuum brake is being fitted to all the larger passenger engines as they go through the shops.

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THE *Chesterfield*, the latest addition to the Great Central Railway fleet of steamers, was launched on October 30, from the Neptune Works, Newcastle-on-Tyne, of Messrs. Swan, Hunter, and Wigham Richardson, Ltd. This fine steel screw steamer is intended for service between Grimsby and Rotterdam, mainly for cargo and horses, and she will also have accommodation for a limited number of passengers. The vessel is 250 ft. in length by 34 ft. beam, and will carry about 1,100 tons of cargo on a light draft of water, and is being built to attain the highest class in Lloyds Register. The propelling machinery consists of triple expansion engines. As the vessel left the ways she was named by Mrs. Clear, in the presence of a goodly company of spectators, including Mr. Clear, Assistant General Manager, and Captain Barwick, Marine Superintendent to the Great Central Railway. Mr. James A. Rodger, the Company's Superintendent Marine Engineer, under whose supervision the vessel is being built, was unfortunately prevented from being present through illness.

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ELECTRIFICATION on the London and North Western Railway is so far advanced that the Willesden Junction-Earls Court motor-trains will, in January, be replaced by electric trains. In due course they will probably run through to Mansion House, and later on the "Outer Circle" service will no doubt be resuscitated in its entirety. For the present current will be obtained from a local supply company, pending the completion of the London and North Western power station. It is understood that the new electric trains will be equipped to co-operate with a special signalling system.

* * *

DRIVER FISHER, who was on the light engine run into by the up Norfolk Coast Express at Colchester, on July 12, recently attended a

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meeting of the Board, when the Chairman of the Great Eastern Railway Company presented him with £50 and the thanks of the Directors for his prompt and brave action. It will be remembered that Col. von Donop referred approvingly to Driver Fisher's action in remaining at his post on the light engine when he realised that a collision was inevitable, remarking that "owing to his promptness in realising the situation and in getting his engine on the move forward, he very greatly minimised the results of the collision, which otherwise must have been of a very much more disastrous nature; this he undoubtedly did at the risk of his life, and he is worthy of the highest commendation for his pluck and promptitude."

* * *

STILL further improvements have been made in the train service of the Great Northern and City section of the Metropolitan Railway. In addition to reducing the time to 9½ min. between Finsbury Park and Moorgate in the morning, and between Moorgate and Finsbury Park to 10 min. in the evening, a service of non-stop trains has been instituted. Between 8.20 and 9.45 in the morning every other train calls only at Highbury and Old Street, with a similar service in the evening between 5.20 and 7 p.m. This constitutes the fastest service between Finsbury Park and the City. Trains leave Finsbury Park every 2 min. from 8.22 till 9.48 a.m., alternate trains calling at Highbury and Old Street only, completing the journey from Finsbury Park to Moorgate in 9½ min. The service throughout the day has been accelerated, the time occupied on the journey from Finsbury Park to Moorgate being 10½ min., and from Moorgate to Finsbury Park 11 min. During the slackest period of the day trains run to and from the City every 4 min. For the busy evening traffic between 5.20 to 7 p.m., trains leave Moorgate every 2½ min., alternate trains being fast, stopping at Old Street and Highbury only. The first and last trains from Moorgate to Finsbury Park are 5.46 a.m. and 11.55 p.m., and Finsbury Park to Moorgate 5.30 a.m. and 11.47 p.m. respectively.

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IT will be recollected that on the occasion of the Royal visit to Crewe works in April, Sir Frank Ree stated that the London and North Western Railway Company proposed to place a tablet in the signal box at Basford Hall Junction to commemorate the fact that the signalman who worked that box in 1913 had been Mayor of Crewe and received the King and Queen at Crewe station. This tablet has now been made, and an illustration of it is given in our London and North Western contemporary. The text reads as follows: "This tablet commemorates the visit of Their Majesties King George V. and Queen Mary to Crewe works on April 21st, 1913, Frederick Manning, a signalman in charge of this box, being Mayor of Crewe. On behalf of his fellow townsmen he received Their Majesties and presented them with an address on their arrival at Crewe station."

* * *

MR. A. W. ARTHURTON is to be congratulated upon winning the prize offered by Mr. Frank Potter, General Manager, for the best essay contributed by any member of the Great Western Railway salaried staff. The subject of his essay was: "The part to be played by railways in the revival of British agriculture." The second prize was awarded to Mr. F. R. E. Davis, Secretary's office, Paddington, for an essay on "Are railway companies unduly handicapped by their statutory obligations?" Consolation prizes were secured by Mr. W. H. Jenkins, District Goods Manager's office, Cardiff ("How to reduce railway clerical work"); Mr. J. J. Clarke, Goods department, Hockley ("The economic limits of the railway and its competitors"); and Mr. E. W. R. Stewart, Goods department, Paddington ("The problem of unentered traffic"). Mr. Arthurton's essay was read before the members of the Great Western Railway (London) Lecture and Debating Society on October 30, while Mr. Davis' essay is to be similarly considered on December 18.

* * *

MR. W. ROBERTS, Chief Engineer, Highland Railway, is retiring at the end of December, after occupying this position since 1898. Mr. Alexander Newlands, C.E., Assistant Engineer, becomes engineer-in-chief in succession to Mr. Roberts. Mr. Newlands was appointed principal assistant to Mr. Roberts in 1898, becoming Assistant Engineer of the railway in 1902.

* * *

AN excellent programme of Christmas and New Year Excursions from Manchester (Central station) has been arranged by the Cheshire Lines Committee. The list includes cheap bookings to the North of Ireland, Isle of Man, Wirral Peninsula, Southport, Chester and other places served by the system. Full particulars may be obtained from the Manager, Mr. John E. Charnley, Central station, Liverpool.

* * *

ON a recent Sunday afternoon a special test run was made from Euston to Crewe with engine No. 1159, *Ralph Brocklebank*, one of the new 4–6–0 "Sir Gilbert Claughton" class. A train, chiefly of sleeping saloons and dining cars equal to 22, and representing a load of 434 tons, was made up, and the dynamometer car was attached. The train left Euston at 1.30 p.m., and in spite of three serious checks made an exceptionally fine run. There were slacks at Tring and Milford, and the train was stopped for 5 minutes outside Crewe. Yet Crewe station was reached at 4.8 p.m., the 158 miles having been covered in 158 minutes, a net time of virtually 2½ hours. The same engine recently completed a notable trial run with an ordinary train, the 141 miles from Crewe to Carlisle being covered in 142 minutes, with about 330 tons.

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THE recent railway accidents at Aisgill, Liverpool, and Waterloo Junction, following one another in rapid succession, and each with a distressing roll of dead and injured, emphasise not only the prudence but the actual necessity of Personal Accident Insurance. The London and Lancashire Fire Insurance Co., Ltd., has its Head Office at 45, Dale Street, Liverpool, with Branch Offices in every important centre,

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and agents everywhere. The Company grants Accident and Sickness Insurances in most attractive forms and at moderate premiums, of which the following are instances:—A premium of £4 secures an insurance of a £1,000 against death by accident and liberal allowances for temporary disablement. A premium of £6 6s. provides, in addition to the above benefits, compensation for a long list of sicknesses and gives double benefits in the case of railway and tramcar accidents. A premium of £10 not only provides for accidents but for sickness of any kind. Those of our readers who are motorists will likewise obtain comprehensive protection for their cars from the "London and Lancashire Fire," who can also supply all that is best in other sections of Casualty Insurance, as for instance Burglary and the Liability of Employers to their Domestic Servants.

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CHRISTMAS is eagerly looked forward to by children of all classes, but particularly so by those who, through unfortunate circumstances, are deprived of spending it in their own home. Such is the case with the inmates of the Railway Servants' Orphanage at Woking, especially as until two years ago they were, by the thoughtful generosity of the late Sir Charles and Frederick Scotter, provided with a royal feast at this season of rejoicing. Last Christmas no good friend amongst the subscribers and well-wishers of the Institution came forward to fill the gap, and, but for a special effort on the part of Mr. Cecil Smith, the Honorary Treasurer of "The Children's Fund," the youngsters' Christmas Day would have lacked its usual attractions so far as their dinner was concerned, as the funds at the disposal of the Board of Management were insufficient to give the children the good time they usually have had on this day. If, therefore, any readers of the RAILWAY MAGAZINE can assist in brightening Christmas Day at the Orphanage, their contributions—however small, and whether in money or kind—will be heartily welcomed, as will donations (urgently needed) to the Maintenance Funds, by Mr. H. G. Warne, the Secretary, L. & S.W.R. Servants' Orphanage Woking. The first Annual Concert in aid of the funds of this institution was given on Saturday, November 8th, at the Assembly Rooms, Surbiton, under the patronage of H.R.H. the Duchess of Albany. In addition to a fine programme of a general character there was a physical display by children from the Orphanage, who also rendered several glees.

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THE Railwaymen's Welfare Association has just issued an interesting and well illustrated booklet entitled "The Railwaymen's Friend." —Bristol has an honorable history in religious and philanthropic work, and it was in that city that some of the pioneer efforts were made for the welfare of railwaymen. In the early seventies Miss Stephenson, a Clifton lady, commenced work amongst the men at Temple Meads station (Bristol), and was later joined by Miss Emma Saunders, who has ever since laboured devotedly and at great personal sacrifice. Assisted by voluntary workers who have gathered around her, she has gone every month amongst the four thousand railwaymen employed in Bristol and the surrounding district, and interested herself in their welfare. Up and down the line, in and out of the sheds, and sidings, and depots, these lady workers have gone, carrying their baskets filled with floral "buttonholes," pausing just a moment to voice a reminder of better things, and to leave their leaflet and gift of flowers, winning the gratitude of the men and the appreciation of the officials. In many other directions the

THE RAILWAYMEN'S INSTITUTE, BATH BRIDGE BRISTOL.

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railwaymen owe more to Miss Saunders than can be expressed. When incapacitated by sickness or accident they have been visited and aided, and their restoration to health and working efficiency quickened by a change of air, good food, and cheerful company by the help of the Sanatoria Fund. Their home life has been brightened and improved by the work carried on amongst their wives and families. Realising that the men, and especially the young men, were made or marred very largely by the way in which they spent their leisure hours, Miss Saunders provided a room where they might meet, and supplied them with books and papers, and games. These were the simple beginnings of a work which in the space of a few years has become a powerful agency for good. It was not long before better accommodation became necessary, but five years later this was outgrown, and the work was removed to Bath Bridge. The present Railwaymen's Institute was opened in February 1910 by Mr. George Riseley, then Sheriff of Bristol, the late Mr. Joseph Storrs Fry presiding. At this centre excellent provision has been made for the men to spend their leisure time in healthy recreation and in self improvement. Most of the railwaymen's clubs and organizations make it their headquarters, the majority having migrated from licensed premises preferring the helpful atmosphere and recreative advantages of the Institute. The present premises include accommodation for various classes, reading room and library, a hall for meetings and entertainments, billiard room, skittle alley, bagatelle room, youths' department, gymnasium, a temperance refreshment bar, and dining and tea rooms. A work of this character, helpful in its influence, and so varied and successful in its operations was bound to extend, and out of it has grown the Railwaymen's Welfare Association for promoting religious, temperance, social and institutional work amongst the railwaymen of the United Kingdom, which has its headquarters at the Railwaymen's Institute, Bristol. Mr. George A. Wills, a Director of the Great Western Railway Company is the President and Miss Saunders is the Treasurer. Mr. H. E. Rossiter, the General Secretary, will cordially co-operate with any friends desirous of promoting work amongst the railwaymen in their own localities.

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SINCE commencing operations in 1861 the United Kingdom Railway Officers and Servants' Association has expended over £55,000 in annuities, £100,000 in rendering assistance in times of sickness, £60,000 in payments to widows and members at death, and about £15,000 for the benefit of orphans and in special grants. The affairs of the Association—which is non-political, non-secretarian, unconnected with other societies, and takes no part in labour questions—are administered by having a Board of Management consisting of officers of various railways. It is, however, largely dependent upon donations and gifts, and in view of its honourable record of usefulness and the wide field of its activities, it fully merits generous support. Further particulars can be obtained from the Secretary, Mr. Alfred James, at the offices of the Association, 21, Finsbury Pavement, E.C., where also donations will be gratefully received.

THERE is a distinct possibility of increased trade between this country and the United States as the result of the large reductions made on certain commodities in the new United States tariff. The Grand Trunk Railway system issues through bills of lading from Europe *vid* the various Canadian and American ports, and are ready to give any information and rates to enable suppliers to quote a delivered price at say Chicago and St. Louis. They operate their own rail as well as lake and rail services, and can, therefore, cater for the high class traffic which requires quick service, as also for that of a rougher nature on which a cheap rate is more essential than the quickest delivery. The Grand Trunk Pacific Railway—an allied Company of the Grand Trunk Railway system—has almost completed building its through lines to the Pacific Coast, and is thus able at the present time to compete and give favourable freight rates as well as quick despatch to such growing centres as Winnipeg, Edmonton, Regina and other towns in the North-West of Canada.

* * *

IN order to facilitate the sending of presents, hampers and the like to friends and relatives in Canada, and in view of the difficulties which sometimes arise when sending packages through the Post Office, by restrictions in regard to measurements and weight, the Canadian Express Company, of 17-19, Cockspur Street, London, S.W., have made special arrangements for sending Christmas parcels of any dimensions cheaply and expeditiously. The following examples of the rates offered may be quoted:—Bristol to Toronto, 6s. 8d. (20 lbs.), 9s. 2d. (30 lbs.), 10s. 8d. (40 lbs.); Liverpool to Hamilton, 7s. 1d. (20 lbs.), 9s. 7d. (30 lbs.), 11s. 1d. (40 lbs.); Glasgow to Montreal, 5s. 8d. (20 lbs.), 8s. 2d. (30 lbs.), 9s. 5d. (40 lbs.). Charges do not include customs duty, but the Canadian Express Company will undertake to pay this item on receipt of a deposit. Further, a great advantage is that the Company (as general carriers) take all responsibility for safe conveyance. It is advisable to send early.

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A WHOLESALE reduction in fares on the London Underground Electric Railways came into operation on November 1st. The line principally interested is the City and South London, but the other railways, including the Metropolitan District, are all affected by this effort to reduce the cost of London's travelling bill. Some examples of the reductions in rates are as follows:—The fare from Clapham Common to Golders Green is now 5d.; from the Angel to Clapham Common is 3d. instead of 5d.; from London Bridge to Finsbury Park is 3d.; and the fare from Victoria to Bow Road has been reduced to 4d.

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THE Directors of the London and South Western Railway have approved new and increased scales of pay in favour of the clerical staff. The new scheme, which comes into operation on January 1st next, will, with few exceptions, embrace all in the grade, and admit of regular advances, according to class, up to a maximum of £200 per annum. In addition, there will be a number of "Special Class" positions carrying higher salaries, open to clerks who have passed through any of the other classes.

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THE Earl of Bessborough, Chairman of the London, Brighton and South Coast Railway Company has been honoured, with the gracious approval of His Majesty, by the President of the French Republic, who has conferred upon him, through the French Ambassador, the Cross of an Officer of the Legion of Honour.

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READERS who are arranging a winter vacation should secure a copy of "Winter Holidays in Summer Scenes," an attractive 48-page booklet published by the London and South Western Railway, descriptive of seaside resorts in the South and West of England, the Channel Islands and Brittany. It contains 12 full page and 40 other excellent illustrations on art paper, and useful information concerning outdoor pastimes, details of fares from London, holiday season tickets, etc. Copies can be obtained from the Superintendent of the Line, Waterloo Station, London, S.E., upon receipt of stamp for postage.

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MR. A. W. BARTLETT read a comprehensive and highly appreciated paper on the Somerset and Dorset Joint Railway to the members of the Railway Club on Tuesday, November 11th. At the meeting on December 9th, Mr. H. L. Hopwood will give a display of lantern slides. The annual dinner will be held at the Holborn Restaurant, on December 12th.

Railway Literature.

THE RAILWAYS OF GREAT BRITAIN. By Lord Monkswell, D.L. [Smith, Elder & Co. Price 6s. net.] This volume is written on a more comprehensive scale than the author's previous book on French Railways. An interesting series of illustrations is included. In the first chapter, dealing with the East Coast route, Lord Monkswell introduces some interesting remarks on railway alliances, competition, and State ownership, and the relations between the railways and the staff. There are also references to locomotive practice, railway vehicles and other matters. Chapter II. more correctly accords with its title: "The Railways of Central England," with references to train control, goods traffic, etc. In the third chapter we find remarks in respect of speed of trains, comparisons with engine performance on the Northern Railway of France, compound locomotives, coal traffic and long-distance passenger trains, as well as comprehensive remarks concerning various phases of the West Coast railways and associated lines. In Chapter IV.—"The Railways to the West"—besides dealing with the Great Western and London and South Western Railways, the author considers railway gauges, water softening, slip carriages, rail motors, permanent way, signals, engine drivers, single line working, brakes and tenders. The concluding chapter similarly reviews the London, Brighton and South Coast, South Eastern and Chatham and Great Eastern Railways, with incidental references to electric traction, Continental traffic, railway finance, local taxation, punctuality, oil fuel and the future of railways. While, however, the foregoing remarks may suggest a rather undecided scheme of compilation, this is not so in reality. In fact the various subjects arise very naturally, developing one from another, which renders the work as a whole a valuable compendium of pertinent remarks concerning numerous phases of railway operations, and presented by a capable and disinterested observer. There is, indeed, much solid information, and many remarks which are worth pondering over and digesting, and Lord Monkswell is to be congratulated on this addition to his literary activities. Copies can be obtained from the offices of THE RAILWAY MAGAZINE, 30, Fetter Lane, Fleet Street, London, E.C.

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WONDERS OF TRANSPORT. By Cyril Hall. [Blackie & Son, Ltd. Price 3s. 6d. net.] This volume, by the author of "Conquests of Engineering" and other works, belongs to the "Triumphs of Enterprise" series now being issued by these publishers. It is of a popular character, at the same time including a great deal of solid and instructive information. It does not purport to give a history of transport; but covers a wide range of subject matter, including many historical references. Well produced, with numerous illustrations, it may be commended for presentation purposes, as well as for personal use. In earlier chapters Mr. Hall deals with animal transport; roads, roadmakers, road vehicles and motor road vehicles; and with sea transport, ancient and modern. Many unusual items are included, besides others which are of interest but not altogether unknown. In the railway section various side issues of railway traffic receive attention, as well as standard features. Aerial navigation then receives attention; and a chapter on "His Majesty's Mails" provides an effective conclusion.

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MODERN RAILWAY WORKING. [The Gresham Publishing Co.] Volume VI. is now issued by the publishers, and well maintains the high standard set by the earlier sections. Mr. Henry Fowler, Chief Mechanical Engineer, Midland Railway, completes his contributions on railway carriage lighting; Mr. Phillip Dawson, deals comprehensively with electric traction on railways; and signalling and train control receives adequate attention at the hands of Mr. Herbert E. Morgan of the W. R. Sykes Interlocking Signal Co., Ltd.

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THE WINTER HEALTH RESORTS OF NORTH WALES. By James N. Frith. This book is issued by the Publicity Department of the London and North Western Railway; but it is much more than an ordinary guide book or an advertising publication. On its own merits it is well worthy of inclusion in a geographical or travel library, containing much information of an interesting character as well as fulfilling its admitted purpose of directing attention to "the unique attributes of the temperate, dry and equable climate" of the North Wales health resorts, and to the facilities offered by the London and North Western Railway. It is well illustrated and printed on art paper, with attractive cover in colours.

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